# REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

VOL. II.

208

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

VOL. II.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.
1914.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.




*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.
*Publication Office.*—27, Elvaston Place, London, S.W.

# ERRATA.

---

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Page | 2 | line | 7 | for | " *Aphism alvae* " | read | *Aphis malvae.* |
| ,, | 2 | ,, | 16 | ,, | " *Areocerus* " | ,, | *Araecerus.* |
| ,, | 2 | ,, | 23 | ,, | " *hyalipennis* " | ,, | *hyalinipennis.* |
| ,, | 3 | ,, | 1 | ,, | " *Calirrhipis* " | ,, | *Callirrhipis.* |
| ,, | 19 | ,, | 24 | ,, | " aperite " | ,, | apterite. |
| ,, | 24 | ,, | 12 | ,, | " *Nephelades* " | ,, | *Nephelodes.* |
| ,, | 26 | ,, | 13 | ,, | " *Bekämfung* " | ,, | *Bekämpfung.* |
| ,, | 35 | ,, | 18 | ,, | " *Pyslla* " | ,, | *Psylla.* |
| ,, | 36 | ,, | 27 | ,, | " *viburini* " | ,, | *viburni.* |
| ,, | 42 | ,, | 24 | ,, | " културныхъ " | ,, | культурныхъ. |
| ,, | 43 | ,, | 43 | ,, | " *austrica* " | ,, | *austriaca.* |
| ,, | 44 | ,, | 47 | ,, | " *Pyslla* " | ,, | *Psylla.* |
| ,, | 46 | ,, | 14 | ,, | " *Derostenus varipes* " | ,, | *Derostenus variipes.* |
| ,, | 49 | ,, | 5 | ,, | " *Botrytes* " | ,, | *Botrytis.* |
| ,, | 54 | ,, | 7 | ,, | " Calcium arsenate " | ,, | Calcium arsenite. |
| ,, | 54 | ,, | 10 | ,, | " Calcic arsenate " | ,, | Calcic arsenite. |
| ,, | 59 | ,, | 41 | ,, | " *hyalipennis* " | ,, | *hyalinipennis.* |
| ,, | 72 | ,, | 6 | ,, | " appoximate " | ,, | approximate. |
| ,, | 73 | ,, | 30 | ,, | " *Pollyphylla* " | ,, | *Polyphylla.* |
| ,, | 92 | ,, | 19 | ,, | " *Coccomytibus* " | ,, | (*Coccomytilus*). |
| ,, | 93 | ,, | 48 | ,, | " *Parsa chloris*, Grote " | ,, | *Parasa chloris*, H. S. |
| ,, | 99 | ,, | 51 | ,, | " Jepson (F. J.) " | ,, | Jepson (F. P.). |
| ,, | 106 | ,, | 35 | ,, | " *polyedricum* " | ,, | *polyhedricum.* |
| ,, | 107 | ,, | 40 | ,, | " cacoa " | ,, | cacao. |
| ,, | 109 | ,, | 47 | ,, | " *alter* " | ,, | *ater.* |
| ,, | 128 | ,, | 1 | ,, | " KRANZLING " | ,, | KRANZLIN (DR.). |
| ,, | 135 | ,, | 36 | ,, | " Weintzg " | ,, | Weinztg. |
| ,, | 139 | ,, | 17 | ,, | " *Acha* " | ,, | *Achaea.* |
| ,, | 143 | ,, | 12 | ,, | " lime " | ,, | line. |
| ,, | 146 | ,, | 42 | ,, | " *Ponciana* " | ,, | *Poinciana.* |
| ,, | 153 | ,, | 41 | ,, | " Johnstone " | ,, | Johnson. |
| ,, | 153 | ,, | 47 | ,, | " *testiceipes* " | ,, | *testaceipes.* |
| ,, | 160 | ,, | 19 | ,, | " *Marcrosiphum* " | ,, | *Macrosiphum.* |
| ,, | 165 | ,, | 41 | ,, | " *Prospalta* " | ,, | *Prospaltella.* |
| ,, | 170 | ,, | 32 | ,, | " *moroccanus* " | ,, | *maroccanus.* |
| ,, | 172 | ,, | 2 | ,, | " *Aphimalus* " | ,, | *Aphimallus.* |
| ,, | 172 | ,, | 38 | ,, | " *Chloropus* " | ,, | *Chlorops.* |
| ,, | 176 | ,, | 48 | ,, | " *devastator* " | ,, | *devastatrix.* |
| ,, | 182 | ,, | 10 | ,, | " *Weinbau der, Rheinp-falz.* " | ,, | *Weinbau der Rheinp-falz.* |
| ,, | 192 | ,, | 27 | ,, | " *Ichnaspis* " | ,, | *Ischnaspis.* |
| ,, | 195 | ,, | 30 | ,, | " vine " | ,, | **vigne.** |
| ,, | 195 | ,, | 38 | ,, | " cryptogramic " | ,, | cryptogamic. |
| ,, | 195 | ,, | 44 | ,, | " cheery " | ,, | cherry. |

ERRATA—*cont.*

| | | | | | |
|---|---|---|---|---|---|
| Page 198 | line 26 | for | "*vividus*" | read | *viridis*. |
| ,, 202 | ,, 19 | ,, | "(*Pachtylus*')" | ,, | (*Pachytylus*). |
| ,, 203 | ,, 4 | ,, | "*Colaspidema atra*" | ,, | *Colaspidema atrum*. |
| ,, 207 | ,, 21 | ,, | "*citricus*" | ,, | *citricola*. |
| ,, 207 | ,, 21 | ,, | "Coccinellid" | ,, | Discolomid. |
| ,, 212 | ,, 27 | ,, | "Ichneunionids" | ,, | Ichneumonids. |
| ,, 212 | ,, 35 | ,, | "*Ambliteles*" | ,, | *Amblyteles* . |
| ,, 222 | ,, 41 | . | "Phryxe" | | *Phryxe*. |
| 223 | 7 | ., | "*cariocatactes*" | ,, | *caryocatactes*. |
| ,, 225 | ,, 43 | ,, | "*Entodon*" | ,, | *Entedon*. |
| ,, 240 | ,, 43 | ,, | "one about 2,900 square yards | ,, | one of about 2,900 square yards. |
| ,, 245 | last line | ,, | "grass leaf-hopper" | ,, | grape leaf-hopper. |
| ,, 246 | line 24 | ,, | "*nutoris*" | ,, | *nutans*. |
| ,, 253 | ,, 8 | ,, | "Quale" | ,, | Quayle. |
| ,, 260 | ,, 16 | ,, | "*Amphimalus*" | ,, | *Amphimallus*. |
| ,, 260 | ,, 32 | ,, | "Krassiltchik" | ,, | Krassilstchik. |
| ,, 261 | ,, 40 | ,, | "ленки" | ,, | оленки. |
| ,, 263 | ,, 19 | ,, | "*Pentathron*" | ,, | *Pentarthron*. |
| ,, 267 | ,, 9 | ,, | "Qualey" | ,, | Quayle. |
| ,, 267 | ,, 19 | ,, | "POSPIELOV (W.)" | ,, | POSPIELOV (V.). |
| ,, 276 | ,, 17 | ,, | "*D. usambica*" | ,, | *Dirphya usambica*. |
| ,, 276 | ,, 27 | ,, | "(*Ceiba bombax*)" | ,, | (*Bombax ceiba*). |
| ,, 277 | ,, 49 | ,, | "*dicincita*" | ,, | *dicincta*. |
| ,, 283 | ,, 47 | ,, | "*cereatella*" | ,, | *cerealella*. |
| ., 287 | ,, 6 | ,, | "VOLSER (E. J.) | ,, | VOSLER (E. J.). |
| ,, 292 | ,, 39 | ,, | "SOUTH (S. W.)" | ,, | SOUTH (F. W.). |
| ,, 296 | ,, 25 | ,, | "*rinnulifera*" | ,, | *pinnulifera*. |
| ,, 307 | ,, 7 | ,, | "*Iridoproche*" | ,, | *Iridoprocne*. |
| ,, 307 | ,, 31 | ,, | "Cecidomyid" | ,, | Agromyzid. |
| ,, 307 | ,, 31 | ,, | "*Cryptochoetum*" | ,, | *Cryptochaetum*. |
| ,, 307 | ,, 34 | ,, | "*Cryptochoetum*" | ,, | *Cryptochaetum*. |
| ,, 308 | ,, 10 | ,, | "*Palaeoceoeus*" | ,, | *Palaeococcus*. |
| ,, 308 | ,, 8 | ,, | "COCKERELL (T. O. A.) | ,, | COCKERELL (T. D. A.) |
| ,, 317 | ,, 15 | ,, | "*Diachasina tyroni*" | ,, | *Diachasina tryoni*. |
| ,, 324 | ,, 22 | ,, | "*subrocinctus*" | ,, | *rubrocinctus*. |
| ,, 338 | ,, 53 | ,, | "*Aelothrips*" | ,, | *Aeolothrips*. |
| ,, 342 | lines 8 & 16 | for | "*Olethreutis*" | ,, | *Olethreutes*. |
| ,, 342 | line 32 | for | "*Ambliteles*" | ,, | *Amblyteles*. |
| ,, 244 | ,, 15 | ,, | "COOLE (A. J.) | ,, | COOKE (A. J.). |
| ,, 353 | ,, 10 | ,, | "Ae" | ,, | A'. |
| ,, 356 | ,, 38 | ,, | "*Zitomastix*" | ,, | *Litomastix*. |
| ,, 357 | ,, 13 | ,, | "*Euergestis*" | ,, | *Evergestis*. |
| ,, 358 | ,, 8 | ,, | "*Aphandrus*" | ,, | *Aphanurus*. |
| ,, 412 | ,, 19 | ,, | "record formula" | ,, | record the formula. |
| ,, 420 | ,, 3 | ,, | "*Paris*, nos. 18–19, 23rd Feb. ;" | ,, | *Paris*, i, nos. 18–19, 20th Feb., |
| ,, 421 | ,, 49 | ,, | "*oleae*" | ,, | *oleellus*. |
| ,, 437 | ,, 6 | ,, | "*augustus*" | ,, | *angustus*. |

ERRATA—*cont.*

| | | | |
|---|---|---|---|
| Page 439 | line 17 | for " *eglantereina* " | read *eglanterina.* |
| ,, 462 | ,, 3 | ,, " *gemminata* " | ,, *geminata.* |
| ,, 464 | ,, 14 | ,, " BALABANOVA (A.). | ,, BALABANOV (M.). |
| ,, 488 | ,, 32 | ,, ,, | ,, ,, |
| ,, 491 | ,, 36 | ,, " *Hydaphis* " | ,, *Hyadaphis.* |
| ,, 491 | ,, 3 | ,, " *rubra* " | ,, *rubus.* |
| ,, 496 | ,, 23 | ,, " Огородничеетво " | ,, Огородничество. |
| ,, 496 | ,, 41 | ,, " Филоксерѣ мѣ-сностямъ " | ,, Филлоксерѣ мѣ-стностямъ. |
| ,, 501 | ,, 8 | ,, " *Gracillaria* " | ,, *Tischeria.* |
| ,, 501 | ,, 29 | ,, " вырашивается " | ,, выращивается |
| ,, 515 | ,, 36 | ,, " *Chloridiea* " | ,, *Chloridea.* |
| ,, 516 | ,, 20 | ,, " Nietsche " | ,, Nitsche. |
| ,, 519 | ,, 25 | ,, " Griddle " | ,, Criddle. |
| ,, 522 | ,, 21 | ,, " uraniagrin " | ,, uraniagrün. |
| ,, 527 | ,, 35 | ,, " *pyrasti* " | ,, *pyrastri.* |
| ,, 539 | ,, 32 | ,, " Chauvigne " | ,, Chauvigné. |
| ,, 539 | ,, 33 | ,, " XII " | ,, XLI. |
| ,, 552 | ,, 3 | ,, " Griddle " | ,, Criddle. |
| ,, 542 | ,, 35 | ,, " *Acrolipia* " | ,, *Acrolepia.* |
| ,, 555 | ,, 13 | ,, " *Irbesia* " | ,, *Irbisia.* |
| ,, 559 | ,, 39 | ,, " Circular No. 16 " | ,, Circular No. 36. |
| ,, 563 | ,, 16 | ,, " *tomontosus* " | ,, *tomentosus.* |
| ,, 570 | ,, 44 | ,, " *Pseudoccocus* " | ,, *Pseudococcus.* |
| ,, 572 | ,, 25 | ,, " *Xylotecus* " | ,, *Xyloterus.* |
| ,, 577 | ,, 41 | ,, " *Subcoccinnella* " | ,, *Subcoccinella.* |
| ,, 596 | ,, 9 | ,, " ? *Enarmonia batra-chopa* " | ,, *Argyroploce leuco-treta.* |
| ,, 607 | ,, 4 | ,, " **Insects** " | ,, **Insectes.** |
| ,, 624 | ,, 10 | ,, " *thespecioides* " | ,, *thespesioides.* |
| ,, 625 | ,, 37 | ,, " LAKIN (G. L.) " | ,, LAKIN (G. J.). |
| ,, 626 | ,, 22 | ,, " Schreiner (Y. F.) " | ,, Schreiner (J. F.). |
| ,, 628 | ,, 38 | ,, " *Pseudoccus* " | ,, *Pseudococcus.* |
| ,, 629 | ,, 24 | ,, " *Polyophineta* " | ,, *Polysphincta.* |
| ,, 630 | ,, 9 | ,, " (*Phlegethontiusquin*) *quemaculatus* " | ,, (*Phlegethontius*) ,, *quinquemaculatus.* |
| ,, 630 | ,, 25 | ,, " *chalcytes* " | ,, *chalcites.* |
| ,, 631 | ,, 37 | ,, " *cordifoila* " | ,, *cordifolia.* |
| ,, 652 | ,, 33 | ,, " HARDENBERG (B. B.) " | ,, HARDENBERG (C. B.) |
| ,, 677 | ,, 35 | ,, " Гнильпу " | ,, Гнильцу |
| ,, 684 | ,, 16 | ,, " *Cheimatobi* " | ,, *Cheimatobia.* |
| ,, 691 | ,, 44 | ,, " *Leonana* " | ,, *Levuana.* |
| ,, 691 | ,, 48 | ,, " *complena* " | ,, *complana.* |
| ,, 697 | ,, 36 | ,, " SURFACE (R. A.) " | ,, SURFACE (H. A.). |
| ,, 716 | ,, 8 | ,, " *longules*, Boh. " | ,, *longulus*, Gyl. |
| ,, 720 | ,, 23 | ,, " arsenate " | ,, acetate. |

VOL. II. Ser. A. Part 1.—pp. 1-56. JANUARY, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.

THE EARL OF CROMER, G.C.B., O.M., G.C.M.G., *Chairman.*

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. AUSTEN, Entomological Department, British Museum (Natural History).
Dr. A. G. BAGSHAWE, Director, Tropical Diseases Bureau.
Sir J. ROSE BRADFORD, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., A.M.S.
Dr. S. F. HARMER, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.
The Hon. Sir JOHN MCCALL, M.D., Agent-General for Tasmania.
Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.
Sir JOHN MCFADYEAN, Principal, Royal Veterinary College, Camden Town.
Sir PATRICK MANSON, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. F. H. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir DAVID PRAIN, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. READ, C.M.G., Colonial Office.
The Honourable N. C. ROTHSCHILD.
Mr. HUGH SCOTT, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. SHIPLEY, F.R.S., Master of Christ's College, Cambridge.
Sir STEWART STOCKMAN, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. THEOBALD, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. J. A. C. TILLEY, Foreign Office.
Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

### General Secretary.

Mr. A. C. C. PARKINSON (Colonial Office).

### Director and Editor.

Mr. GUY A. K. MARSHALL.

### Assistant Editor.

Mr. W. NORTH.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

IMPERIAL BUREAU OF ENTOMOLOGY.

# REVIEW

OF

# APPLIED ENTOMOLOGY.

SERIES A.

VOL. II.] [1914.

ZACHER (F.). **Die Afrikanischen Baumwollschädlinge.** [African cotton pests.]—*Arbeit k. biol. Anst. Land- und Forstwirtschaft, Berlin*, ix, no. 1, 1913, pp. 121-230, 83 figs.

Insect pests of the cotton plant in Africa are described at considerable length. The significance of the pests, methods of combat by means of poisons, traps or natural enemies, other plant hosts of the insects, and the immunity of certain species of plants are discussed. Insects which are useful to cotton in preying upon harmful insects are mentioned. The life-history of many of the pests is given. The following is a list of injurious insects, arranged according to the part of the plant they attack.

Damaging the roots :—ORTHOPTERA : *Brachytrypes membranaceus*, F. ; LEPIDOPTERA : larvae of *Euxoa segetum*, Schiff., *E. spinifera*, Hb., and *Agrotis ypsilon*, Rott ; COLEOPTERA : larvae of *Tetralobus* sp., *Heterodes* sp., *Aeolus inscriptus*, Er., *Diplognatha gagates*, F., *Camenta westermanni*, Har., *Schizonycha serrata*, Aulm., *Enaria melanictera*, Klg., *Popillia hilaris*, Kr., *Synistovalgus bifasciatus*, Kr.

Damaging the stem :—COLEOPTERA : *Alcides brevirostris*, Boh., *Sphenoptera gossypii*, Kerr., *S. neglecta*, Klg., *Apate monachus*, F., *Hypothenemus eruditus*, Westw., *Apion armipes*, Wagn., *A. xanthostylum*, Wagn.

Damaging the leaves :—RHYNCHOTA : *Pseudococcus virgatus*, Ckll., *Chionaspis aspidistrae*, Newst., *C. aspidistrae* var. *gossypii*, Newst., and *Lecanuim nigrum*, Nietn. ; ORTHOPTERA : *Schistocerca peregrina*, Ol., *Zonocerus elegans*, F., *Phymateus viridipes*, Stal., *Phaneroptera nana*, Fieb. ; LEPIDOPTERA : larvae of *Sylepta derogata*, F., *Hymenia* (*Zinkenia*) *fascialis*, Cram., *Basiothia charis*, Wlk., *Hippotion celerio*, L., *Celerio lineata*, F., var. *livornica*, Esp., *Prodenia litura*, F., *Euxoa segetum*, Schiff., *E. spinifera*, Hb., *Agrotis pronuba*, L., *A. ypsilon*, Rott., *Plusia confusa*, *P. circumflexa*, *Cosmophila erosa*, Hb., *Porthesia virguncula*, Walk., *Nudaurelia* sp., *Tephrina contexta*, Saalm., *Syngamia abruptalis*, Wlk. ; COLEOPTERA : *Diplognatha gagates*, F., *Camenta*

*westermanni*, Har., *Schizonycha serrata*, Aulm., *Enaria melanictera*, Klg., *Popillia hilaris*, Kr., *Synistovalgus hemipterus*, Kr., *Epipedosoma laticolle*, Kolbe, *Systates pollinosus*, Gerst., *Aphthona* sp., *Nisotra uniforma*, Jac., *Syagrus puncticollis*, Lef., *Ootheca mutabilis*, Sahlb., *O. bennigseni*, Wse., *Tituboea ruficollis*, Ol., ; RHYNCHOTA : *Helopeltis bergrothi*, Reut., *Calidea bohemani*, Stål, *C. apicalis*, Schout., *Hotea subfasciata*, Westw., *H. acuta*, Stål, *Aphism alvae*, Koch, *A. gossypii*, Glov., *A. sorghi*, Theo. ; ACARI : *Tetranychus* sp.,

Damaging the flower :—LEPIDOPTERA : larvae of *Earias insulana*, Boisd., *Chloridea obsoleta*, F. ; COLEOPTERA : *Mylabris bizonata*, Gerst., *Coryna hermanniae*, F., *C. dorsalis*, Gerst.

Damaging the boll and seeds :—COLEOPTERA : *Diplognatha gagates*, F., *Apion xanthostylum*, Wagn., *Cathorama* sp., *Tribolium ferrugineum*, F., *T. confusum*, Duv., *Laemophloeus pusillus*, F., *Palorus melinus*, Hbst., *P. ratzeburgii*, Wissm., *Silvanus surinamensis*, F., *Tenebroides mauretanicus*, L., *Bruchus chinensis*, L., *Areocerus fasciculatus*, de G. ; LEPIDOPTERA : larvae of *Chloridea obsoleta*, F., *Diparopsis castanea*, Hmp., *Earias insulana*, Boisd., *E. fabia*, Cr., *E. chromataria*, Wlk., *E. plaga*, Boisd., *Gelechia gossypiella*, Saund., *Pyroderces simplex*, Wlsm., *Stagmatophora gossypiella*, Wlsm., *Agrotis ypsilon*, Rtt., *Euxoa spinifera*, Hb., *Ephestia cautella*, Walk. ; RHYNCHOTA : *Dysdercus cardinalis*, Gerst., *D. fasciatus*, Sign., *D. nigrofasciatus*, Dist., *D. superstitiosus*, F., *Oxycarenus hyalipennis*, Costa, *O. gossypinus*, Dist., *O. dudgeoni*, Dist., *O. exitiosus*, Dist., *D. albidipennis*, Stål, *Leptoglossus membranaceus*, F., *Anoplocnemis curvipes*, F. ; DIPLOPODA : *Odontopyge* sp.

The insects useful to the plant are chiefly Hymenoptera, which destroy many injurious species. *Alesia striata* (COCCI-NELLIDAE) is is mentioned as destroying scale-insects.

ZACHER (F.). **Die Schädlinge der Kokospalmen auf den Südseeinseln.** [Pests of the coconut-palm in the South Sea Islands.]—*Arbeit. k. biol. Anst. Land- und Forstwirtschaft, Berlin*, ix, no. 1., 1913, pp. 73-119, 38 text figs.

A complete list of the insect pests of the coconut-palm in the South Sea Islands. In most cases a description is given of the insect, together with details as to its distribution, life-history, and mode of attack. The following species are mentioned :—

COLEOPTERA : *Oryctes rhinoceros*, L., *O. preussi*, Kolbe, *Trichogomphus semilinki*, Rits., *Xylotrupes nimrod*, Voet, *X. corquini*, Deyr., *Scapanes australis*, Boisd., *S. grossepunctatus*, Sternbg., *Oryctoderes latitarsis*, Burm., *Pimelopus tenuistriatus*, Aulm., *P. preussi*, Aulm., *P. robustus*, Aulm., *P. pygmaeus*, Aulm., *Horonotus quadrituber*, Zacher, *Mycterophallus xanthopus*, Boisd., *Glyciphana versicolor*, F., *Eubussea dilatata*, Zacher, *Eurytrachelus pilosipes*, Waterh., *E. intermedius*, Gestro, *Metopodontus cinctus*, Montr., *Rhynchophorus ferrugineus*, Ol., *Rhabdocnemis obscurus*, Boisd., *Calandra taitensis*, Guér., *Atactus deplanatus*, Boh., *Oxycephala* (*Xiphispa* ?) *chalybeipennis*, Kolbe in litt., *Brontispa froggatti*, Sharp, *Promecotheca antiqua*, Weise, *P. opacicollis*, Gestro, *P. reichei*, Baly., *Xixuthrus costatus*, Montr., *Olethrius tyrannus*, Thoms., *Stenodontes insularis*, Fairm., *Monohammus* sp., *Sessinia livida*, F., *A. collaris*, Sharp., *A. palmarum*,

Kolbe in litt., *Calirrhipis femorata*, Waterh; LEPIDOPTERA: *Levuana iridescens*, *Harpagoneura complexa*, Butl., *Tinea* sp. ORTHOPTERA: *Graeffea cocophaga*, Newp., *Anaulacomera insularis*, Stål, *Theutras pallidus*, Walk.; ISOPTERA: *Eutermes* sp.; RHYNCHOTA: *Basiliocephalus thaumatonotus*, Kirk., *Aleurodicus* sp., *A. destructor*, Quaint., *Aspidiotus destructor*, Sign., *Furcaspis oceanica*, Lind.; ACARI: *Tetranychopsis* sp., *Bdella* (?) sp.

The author points out that a great many of the species are probably insignificant as regards the damage done, but he considers that it is desirable to have on record a complete list of the actual and potential pests of this important tree.

FERNALD (H. T.). **Insecticides, Fungicides, and directions for their use.**—*Massachusetts State Board of Agriculture, Boston, Circ.* no. 2, 1913, 24 pp.

The author gives a comprehensive list of insecticides and fungicides, with formulae and general instructions for their use. A large number of common insect pests are mentioned, and brief advice as to treatment given.

FERNALD (H. T.). **Three common scale-insects.**—*Massachusetts State Board of Agriculture, Boston, Circ.* no. 6, 1913, 10 pp., 6 figs.

The author describes the San José, the Oyster-shell and the Scurfy Scales and gives full directions for the preparation and application of the insecticides most efficacious against these pests.

WOODWORTH (C. W.). **Codling moth control in the Sacramento Valley.**—*Univ. of California, Coll. of Agric., Berkeley, Circ.* no. 101, June 1913, 4 pp., 3 figs.

The fruits affected are the apple and the pear. By the use of arsenical poisons the loss can be reduced to about one per cent. or less. As the worm first bores deeply into the fruit it is suggested that the subsequent surface-feeding is the fatal operation, but so far our knowledge is insufficient to explain the reasons for the efficiency of the poison. All investigators agree that it must be applied before the larva enters the fruit. In the case of pears and autumn apples, unless this first spraying has been thorough, a second brood will also require attention in the latter part of July or early in August. Its appearance may be noted if bands of sacking are placed round a few trees and examined about the 1st and 15th of July and August. One thorough spraying for summer apples and one or two for autumn apples and pears will completely control the codling moth in the Sacramento Valley. For a single medium-sized tree, $\frac{1}{2}$ pint of lead arsenate in 5 gallons of water is sufficient. For a quarter of an acre of orchard 3–6 lbs. lead arsenate in 100 gallons of water is enough. Instead of this weight of lead arsenate, one-third of zinc arsenite, or one-quarter of Paris green, may be used. In the latter case lime (three times as much)

should be added. This holds the arsenical to the tree and also marks the tree so that the thoroughness of the application may be visible to the eye.

Woodworth (C. W.). **The Woolly Aphis.**—*University of California, Coll. of Agric., Berkeley, Circ.* no. 102, June 1913, 4 pp., 1 fig.

Believed to be of American origin, and called " American blight " by English entomologists, this insect has now been shown to be another form of the elm aphis (*Eriosoma ulmi*).

" Northern Spy " roots have been used with great success against it in Australia, where it is a serious pest. They are equally efficient in California, and should be used wherever the woolly aphis requires combating. If nursery stock is wanted quite free from the insect, the production of winged forms in the neighbourhood of the nursery should be prevented. Elm trees should be carefully inspected in spring, and as soon as the swollen leaves become conspicuous these should be removed. Apple trees in the vicinity should be kept free from twig infestation. Should the nursery become infested, it is best to dig up and destroy everything that has been attacked, as the wingless forms may spread along the nursery rows. Though this is not the case in California, there are places where treatment is justifiable. The simplest and generally cheapest method is the direct application of kerosene or gasolene with a swab or brush. Too much oil will produce dead spots on the bark. The work is as quick as spraying, and is immediately and completely effectual. The trees should be gone over about once a week in spring until the danger of rapid increase is past. If the insects cannot be economically treated with oil, spraying will be necessary, and a nicotin spray is the best. Nicotin sulphate 40%, 1 lb., and cresol soap 1 gallon, in 200 gallons of water, form an effective solution ; the soap simply increases the penetration. Spraying must be thoroughly done. There appears to be no danger of winged forms issuing from the roots, but sometimes it may be desirable to prevent the lice from migrating. The easiest method is to dig out a few shovelsful of earth round the roots and fill in with sand.

Parker (J. R.). **The imported cabbage worm and the cabbage aphis.**—*Montana Agric. Coll. Expt. Stn., Bozeman, Montana, Circ.* no. 28, Aug. 1913, pp. 9-24, 12 figs.

The cabbage heads are rendered unsightly and unfit for a first-class market by the dark green excrement of the " imported cabbage worm " (*Pieris rapae*, L.), and if they are badly riddled, growth is stopped. It is well to plough under or otherwise destroy all cabbage stumps and leaves remaining from the crop, as they afford ideal breeding places. A few heavily-poisoned stumps may be left to act as traps. A spray, containing either Paris green, arsenate of lead or arsenite of zinc, may be used immediately there is any noticeable injury. The author says that there is no danger in eating cabbage

sprayed with arsenicals. Another cabbage worm found in Montana, the larva of the diamond-back moth (*Plutella maculipennis*), is amenable to the same measures.

The cabbage aphis (*Aphis brassicae*, L.), also uses crop remnants for depositing its eggs, and since weeds, such as wild mustard and shepherd's purse, serve as breeding places for the early generations of the lice, they should not be tolerated near cabbage fields.

A most effective spray is: Black leaf tobacco extract, 8 oz.; soap, 4 oz.; water, 4 gals. If "Black Leaf 40" is used, only 3–4 oz. need be taken. The soap makes the spray spread evenly on the waxy surface of the cabbage and makes it penetrate the mealy covering of the lice. Failing tobacco extract, a good alternative is a strong solution of soap; soap or washing powder 1 lb., and water 4 gals.; and for cauliflowers its non-staining property is a real advantage.

Clerc (G. O.). **Rapport sur une mission dans le gouvernment d'Oufa pour déterminer les insectes déprédateurs et indiquer les moyens de les combattre.** [Report of a commission in the Govt. of Oufa, for the determination of insect pests and the means of combating them.]—*Bull. de la Soc. Ouralienne, Amat. Sci. Nat., Ekaterinburg*, xxxii, no. 2, 1913, pp. 140-145.

In July 1912, the author made an expedition into the district of Oufa with the purpose of examining crops which were being destroyed by insects. In the neighbourhood of Bélébeï, the crops of wheat and oats had at first been very promising, but, as the summer advanced they were attacked by insects, and it was evident that the harvest would be reduced to anything between 50% and 0% of the usual. As the weather at the time of examination was unfavourable for finding insects, the author did not succeed in catching any adults, but he obtained a large number of pupae of *Mayetiola* (*Cecidomyia*) *destructor*, Say, and of *Oscinis frit*, L. Plants which were unattacked by these insects were often infested with Thrips.

In the district of Birsk the condition of the crops was even worse, especially in the case of wheat. Aphididae, *Cecidomyia*, *Oscinis* and *Thrips* were found in abundance. Oats had suffered principally from Aphididae and *Oscinis*. Fields of millet and buckwheat were unattacked. The author advocates ploughing the fields to a depth of 16–20 cms. (6·4″–8″), and burning the stubble with the roots before *Cecidomyia* and *Oscinis* emerge from their cocoons.

Cæsar (L.). **Our most troublesome orchard insects and diseases.**—*Forty-fourth Annual Report of the Fruit Growers' Association of Ontario for* 1912, *Ontario Dept. Agric., Toronto*, 1913, pp. 13-31, 19 figs.

The title sufficiently explains the scope of this paper (see this *Review*, Ser. A, i, p. 404), in which the author also gives a list of remedies and notes on the methods of their employment.

FELT (E. P.). **The use of oils on dormant trees.**—*Twenty-eighth Report of the State Entomologist*, 1912, *N.Y. State Mus., Albany, New York, Bull.* no. 165, 15th July 1913, pp. 83-92.

The author says that the spraying of dormant trees with oils, especially mineral oils, is one of the more recent developments of insect control, and it has been said by enthusiasts that the application is harmless. He gives examples showing that there are a number of so-called miscible oil preparations on the market the careless use of which is attended with danger, and he summarises his conclusions as follows :—

The use of oils or oil preparations on dormant trees has been followed in several cases by severe injury. Trees, as living organisms, respond to climatic and cultural conditions, and as a consequence their power of resisting penetration and injury by oils undoubtedly varies with the season, and probably with age, from year to year. Since certain weather conditions promote injury by oils, it appears impossible to be sure that deleterious effects may not follow the spraying of dormant trees with an oil preparation. Autumn treatment with oil appears to be more hazardous than spring applications. Other things being equal, the author believes that there is less danger of penetration by oil, and consequent injury, if the applications are made in the spring, shortly before active growth begins, as there is then likely to be greater resistance to the entrance of oil, or more rapid renewal of necessary vital tissues that may be destroyed by it.

SHEVIREV (I.). **Oviposition in Ichneumon Flies.**—*Jl. R. Micr. Soc., London*, pt. 4, Aug. 1913, p. 385.

Iv. Shevirev has experimented with *Pimpla instigator* and other species, to which he gave pupae of different sizes, *e.g.*, of *Sphinx* and of *Pieris*. If only large pupae are supplied the progeny will be almost wholly female ; by supplying only small pupae, the female offspring can be practically eliminated. It appears as if the females, like queen-bees, adjusted the kind of egg laid to the nutritive conditions available. In another paper (C.R. Soc. Biol. Paris, lxxiv, 1913, pp. 698–9) the author refers to parthenogenetic females. While the fecundated females lay eggs which develop into both sexes, those laid by virgin females produce males only. In the case of the fecundated females, the eggs which produce males are unfertilised eggs.

HERRICK (G. W.). **Control of two Elm-tree pests.**—*Cornell University, Agric. Exp. Sta., Coll. Agric., Dept. Entom., Ithaca, N.Y., Bull.* 333, May 1913, pp. 491-512, 19 figs.

The author reports in detail successful operations against the elm leaf-beetle (*Galerucella luteola*, Müll.), and the elm leaf-miner (*Kaliosysphinga ulmi*, Sund.) Arsenicals were employed against the former pest and "Blackleaf 40" tobacco extract against the latter. The author recommends that in planting shade trees adjacent streets should be planted with different species, as thus an outbreak of any single pest can be easily checked and controlled.

Gray (G. P.). **Analyses of insecticides for users.**—*University of California, College of Agriculture, Berkeley, Circ.* no. 105, Aug. 1913, 7 pp.

The California Insecticide Law provides that " the . . . Directory of the Agricultural Experiment Station of the University of California shall, upon the receipt of a sample of the insecticide, accompanied by a nominal fee of one dollar, furnish to the user of the said commercial insecticide, such examination or analysis of the sample as will substantially establish the conformity or non-conformity of the said insecticide to the guarantee under which it is sold."

It is pointed out that a complete analysis will not usually be made, but only such an examination or analysis as will fulfil its object, and also that analysis will not be made for dealers. The great care which is necessary when drawing a sample is specially insisted on.

Woodworth (C. W.). **The Amended Insecticide Law.**—*University of California, College of Agriculture, Berkeley, Circ.* no. 104, Aug. 1913, 10 pp.

This pamphlet gives the full text of the law of 1911 enacted in California, as it now stands, with footnotes commenting on each of the changes.

Gehrmann (K.). **Krankheiten und Schädlinge der Kulturpflanzen auf Samoa.** [Diseases and pests of cultivated plants in Samoa.] —*Arbeit. k. biol. Anst. Land- und Forstwirtschaft, Berlin*, ix, no. 1, 1913, pp. 1-120.

The rhinoceros beetle (*Oryctes rhinoceros*) is the chief insect pest of coconut palms in Samoa. The palm-borer (*Rhynchophorus ferrugineus*) which is found throughout the Indian Archipelago, and also in New Guinea, the leaf-eating coco moth (*Levuana iridescens*) and the dreaded coco scale-insect (*Aspidiotus destructor*) are all, at present, absent from Samoa. After discussing at some length the possibilities of combating the rhinoceros beetle, the author gives the instructions issued by the Government in the Straits Settlements and in Singapore in connection with this pest, which may be briefly summarised as follows :—All infested trees are to be burnt or buried, or sunk in water, so that the eggs, larvae, pupae and beetles will be destroyed. Anyone keeping on his land dead coconut palms, etc., which would harbour the beetle, is to be fined : and Government officials shall be allowed to enter gardens and plantations for the purpose of seeing that the instructions are carried out.

There seems to be no direct method of combating the pest. The danger for Samoa lies in the fact that the beetle has only recently been introduced ; it is likely, therefore, to multiply considerably, and Samoa offers every condition favourable to its spread.

Carpenter (G. H.). **Injurious Insects and other Animals observed in Ireland during the year 1912.**—*Econ. Proc. R. Dublin Soc.*, ii, no. 6, Aug. 1913, pp. 79-104, 9 figs, 2 pls.

Grubs of the Garden Chafer (*Phyllopertha horticola*), were received in September from Co. Galway, where it is said that they do the greatest damage to "second grass." Rooks were observed to pull up the dead plants in order to get at the grubs. Specimens of the Frit Fly (*Oscinis frit*) were received from Co. Dublin. Turnips, with the sub-globular galls due to the maggots of the Root-gall Weevil (*Ceuthorrhynchus pleurostigma*, Marsh.), were received in March from Co. Galway, and in April, from the neighbourhood of Belfast. Cabbage and cauliflower plants were received from Co. Clare, the stems of which were bored by a somewhat large Curculionid grub, not yet identified. The injury ultimately kills the plants. The only measure that can be recommended is the removal and burning of the infested plants. Specimens of the Potato-leaf Beetle (*Psylliodes affinis*) were received from Co. Tipperary and Co. Kerry. In Ulster, the Flax Flea-Beetle was very active in 1912; spraying with lead arsenate is suggested. Specimens of small white Annelid worms, of the family *Enchytraeidae*, were received from Co. Monaghan, with the statement that they were injuring celery, carrots, parsnips, and onions. They have been identified as *Enchytraeus albidus*, Henle, which is very common in farmyard manure. Celery roots were sent in February from Co. Down, tunnelled by the maggots of the Carrot Fly (*Psila rosae*), proving that they can live through a mild winter. One sample of apple shoots sent from Portadown, was found on 29th May to be infested with *Aphis pomi*, *A. sorbi*, *Psylla mali*, and caterpillars of the Winter Moth (*Cheimatobia brumata*) and of a species of *Tortrix*. Later on, more *Aphis sorbi* were sent from Counties Antrim, Waterford, and Dublin, and *Aphis opmi* from Waterford and Tipperary. In July an apple shoot especially badly infested by the Woolly Aphis was received from Co. Limerick. The Apple Sucker (*Psylla mali*) did a vast amount of damage to apple blossoms in May 1912. Specimens of shrivelled buds containing the insects were received from Counties Dublin, Kerry, Armagh, and Tyrone. In some cases the hairy black fly, *Bibio marci*, was noticed in numbers around the injured blossoms and was wrongfully accused of causing the damage. Specimens of the ruddy Shield Bug, *Acanthosoma haemorrhoidale*, were sent, in February, 1912, from Co. Cork, where they were sucking the unopened buds of apple trees. From Rathfarnham specimens of the Clay Vine Weevil (*Otiorrhynchus picipes*) were received, with information that the young black-currant bushes were badly damaged; entire shoots were sometimes devoured. *Phyllobius oblongus* and *P. viridiaereus* are recorded as damaging apple foliage.

Caterpillars of the Winter Moth (*Cheimatobia brumata*) were very abundant in many parts of the country, feeding on apple, plum, currant, and gooseberry. Apple shoots disfigured by the webs of the Small Ermine Moth (*Hyponomeuta malinellus*) were received in April and May from Co. Dublin. Apples bored by the caterpillars of the Codling Moth (*Cydia pomonella*) came from Co. Clare in June. Caterpillars of the Common Bell Moth (*Tortrix ribeana*) were found in May eating apple shoots in Co. Dublin. For their destruction early spray-

ing in April with lead arsenate wash is recommended. Apples containing larvae of the Apple Sawfly (*Hoplocampa testudinea*) were received from Counties Tyrone, Tipperary and Kildare. The Pear Gall Mite, *Eriophyes pyri*, and the Black Currant Gall Mite, *E. ribis*, were reported, the former from Co. Dublin, the latter from Co. Kerry. The acclimatisation in Ireland of the Australian Fern Weevil (*Syagrius intrudens*) is recorded ; ten years ago it was extremely destructive to ferns in the Royal Botanic Gardens, Glasnevin, and now it is breeding in the open.

PICARD (F.). **Sur un Braconide nouveau parasite de *Sinoxylon sexdentatum*, Ol., dans les sarments de vigne.** [On a new Braconid parasite of *Sinoxylon sexdentatum*, Ol., on vine shoots.]—*Bull. Soc. Entom., France, Paris*, no. 16, 1913, pp. 399-402, 1 fig.

*Sinoxylon sexdentatum* is the most common Bostrychid in the South of France ; it is found in vine branches, which it reduces to a state of dust. Many enemies of this insect are known ; some predaceous, such as Histerids, Malachiids, and Clerids ; others parasitic, such as the Acarid, *Pediculoides ventricosus*, and the Proctotrypid, *Cephalonomyia formiciformis*. The author is the first to record a Braconid parasite of this beetle. The species which he describes is new, viz., *Monolexis lavagnei*, and was taken in large numbers from *S. sexdentatum* infesting vines. The insect is not exclusively parasitic upon *S. sexdentatum*, but has been found in connection with *Scobicia pustulata*, F., and *Xylonites praeustus*, Germ. It may also attack Scolytids.

SCHALVINSKY. **Непарный шелкопрядъ въ Лебедянскомъ лѣсничествѣ.** [*Lymantria dispar* in the Lebediansk Forest (Govt. of Tambov)]. **«Лѣсная жизнь и Хозяйство»** ["*Forest Life and Economy*"]. *Published by the Tambov Administration of Agriculture and State Domains, Tambov*, 1913, no. 5, pp. 9-14.

The Matiushin estate of the Lebediansk forest has frequently been visited by *Lymantria dispar*, especially those plots where oak plantations are more or less mixed with birch and aspen, and where the " tchornosiom " soil is covered by a rich growth of grass. The age of these attacked plots is 40–80 years, the thickness of the trunks from 0·6 to 0·8 metre. The insect practically avoids young plantations up to 20 years old, as well as thin plantations or glades. They also seem to avoid light, usually starting to eat the foliage on the windward side and in places where the trees are dense. The larvae emerge from the eggs in the middle of April, and pupation usually begins from the 13th to 26th June. Should there be rain and a change to cold weather, the larvae perish without pupating. The pupae are found on the branches and trunks, and a month later (13th–26th July) the perfect insects appear. The females oviposit in the lower cracks of the bark, laying their eggs in groups of 20–50, and the moths disappear in the middle of August.

The author describes the result of destroying the unhatched eggs by scraping, burning, or scattering them. These remedies invariably

gave only partial results, as some of the eggs developed even in unfavourable positions. According to Shevirev, *L. dispar* is seldom dangerous in natural forests, and he recommends fighting the insect only in natural woods growing under unfavourable conditions, or near plantations, nurseries or orchards; in any case, he recommends smearing the egg-masses with naphtha. The author gives an example of the cost of this remedy, which, including peasant women at 20 copeks (5d.) a day, and naphtha, of which about 32 cwt. were used, amounted to about 5d. per acre. On the plots that were most thoroughly treated there were no unhatched eggs. The results showed that in these spots there were practically no caterpillars in the spring of 1912, and no damage to the leaves. In the neighbouring plots, which were not smeared, the insects appeared in more or less large quantities, and would have done great damage if the weather conditions had not arrested their development. The author is quite satisfied as to the efficiency of this remedy.

Bagrinovsky (—.). **Отчетъ о борьбѣ съ вредными насѣкомыми въ Куликовскомъ Лѣсничествѣ Тамбовской губ. эа 1912 годъ.** [Report on the fighting of injurious insects in the Kulikov Forest of the Govt. of Tambov in 1912].—**« Лѣсная жизнь и Хозяйство »** ["*Forest Life and Economy*"].—*Tambov*, 1913, no. 5, pp. 31-35.

As the result of excavations conducted by Prof. I. K. Tarnani in autumn of 1911, he was satisfied that the year 1912 would be a bad year for *Melolontha* on the Kulikov estate, while on the Demshin estate this was to be expected only on one plot. These expectations proved correct, and the " May beetles " on the former estate appeared in enormous numbers. The author further describes the collection of the beetles organised on about 13,500 acres of the Kulikov estate, and on 12,000 acres of the Demshin estate, which resulted in the accumulation of 15 tons of insects, for which a sum of £200 was paid; 964 people, mostly women and children, were engaged in the work, which lasted from the 2nd June to 6th July. The beginning of field and market-garden work, as well as the decrease in the number of flying beetles, led to a gradual diminution in the quantities collected after the 29th June; the amounts brought in varied from $3\frac{1}{2}$ cwt. to 14 cwt. per diem before the 16th June, after which date the daily collections were never more than 268 lb., being only 9 lb. on the 23rd of that month. For each pound of live beetles from $\frac{3}{4}$d. to $1\frac{1}{2}$d. were paid. The procedure adopted was to shake the trees, when the beetles fell down and were collected in bags, etc. The bags containing the insects were put into boiling water, after which they were emptied into deep pits. In order to check the stench produced by the dead bodies of the beetles, the heaps were sprayed over with lime. It is estimated that at least seven and-a-half millions of females were destroyed.

Some experiments were also started to test the effect of various insecticides, Paris green, barium chloride, and white arsenic, on young seedlings. Underneath some small oak bushes sprayed with Paris green or barium chloride no dead beetles were found, and the insects evidently avoided these plants.

Zhitkov (Gr.). **Работы 1912 г. Фащевскаго опытнаго лѣсничества по изученію майскаго жука** [Studies on *Melolontha* in the Fastchevsk experimental forest, Govt. of Tambov, in 1912.]—**« Лѣсная жизнь и Хозяйство »** ["*Forest Life and Economy*"].—*Tambov*, 1913, no. 6, pp. 6-17, no. 7, pp. 4-17, and no. 8, pp. 18-25.

The Fastchevsk forest was formed principally in order to study the best means of fighting *Melolontha*, which is the most serious pest of pine forests. In 1912, owing to the cold weather prevailing, the flying of the beetles was noticed only on the 13th May at an air temperature of 1·4°C. (34·5°F.) and a soil temperature of 0·2°C. (32·3°F.); on the 14th May the temperature fell again, and not until the 19th May, when the weather became definitely warmer, did the flight in great masses begin. The author describes first the results of the collection of beetles *en masse*; about 564 poods (181 cwt.) of insects were collected and destroyed. For each pound of insects collected five kopeks ($1\frac{1}{4}$d.) were paid, and on some days as many as 24 cwt. were brought in. Only specimens of *Melolontha hippocastani* were obtained, in two varieties, one with dark legs and black scutellum (this being in the majority), and another with pale legs and reddish scutellum. No specimens of *Melolontha vulgaris* were found. With regard to oviposition, observations have shown that the females avoid bare places, though bare fallow is not an absolute protection against oviposition, and that the females dig holes for their eggs in places not exposed to the rays of the sun, the eggs not being able to develop in dry soil. In such exposed places there are no plants, the appearance or smell of which would prevent the female ovipositing near them; rye alone seemed not to be favoured by them.

Experiments conducted to show whether the insects can fly for long distances did not prove conclusive, for no marked beetles were recaptured. The insects are not attracted by light.

The author refers to the statement that white alder grown in nurseries will protect them against the insects, but on one plot on which alders were sown in 1910–11, the insects appeared just as usual. Observations are still required as to how the larvae behave towards the roots of alders, and how it is that this tree withstands their attacks. Experiments as to the effect of various insecticides in protecting the roots of trees from the larvae were made, and Paris green, arsenic, barium chloride, naphthalin and tobacco dust proved harmless to the young seedings, except Paris green, when used in a proportion of more than $3\frac{1}{2}$ drams in 2·7 gallons of water, and naphthalin in a proportion of $\frac{1}{2}$ lb. or more in the same quantity of water. The plots in which the surface of the roots had been poisoned with these insecticides were afterwards artificially infected with larvae of *Melolontha*, in one case also those of *Serica*, but no damage was noticed in the autumn of 1912; these experiments are to be repeated in 1913. As to the supposed preventive influence of straw and dry oak leaves, the experiments did not prove conclusive, although they produced no evidence against these remedies. The author is not satisfied that birches ought to be excluded from pine plantations; although they no doubt serve as food for the insects, the same applies also to every young tree with tender leaves:—oak, ash, lime, hazel, and sorb. The author con-

tradicts the statement that the collection of the beetles cannot be considered sufficient and effective; he believes that the remedy, if applied, not as an experiment, but on a large scale and *everywhere* in the Government will yield good results, and that only after several years of such collection will it be possible to judge conclusively as to its efficiency. He further describes the result of digging the earth, in order to ascertain the numbers of eggs, larvae, pupae, and adults wintering in the soil. A table is given showing the result of the examination of 1,625 holes, each one metre square. In July and August the soil was dug out to the depth of 1 metre; in September and October, to a depth of $1\frac{1}{4}$–$1\frac{1}{2}$ metres. It appears from the table that the collection of beetles was by no means useless, the number of eggs and young larvae in those places where collection was practised being generally less than one-third of that in places where no collections where made; though in both cases an equal number of larvae of older stages (not bred in 1912, but before) were found. Keeping the soil friable decreases the number of larvae; crop-growing on spots where the trees are cut away also gives positive results; in sandy soil the larvae are fewest, next coming pine woods, and then spaces that have been cleared of trees; the heaviest infestation is in soil around deciduous trees; old trees are preferred by the females to younger ones, if both grow together on the same spot; floods from the river Dvuretchka had no influence on the larvae. The author recommends the digging of holes yearly, and on a large scale, to obtain more reliable information as to the present and future occurrence of the beetles.

In conclusion, the author gives an account of various experiments, from which it appears that the larvae require moisture for their development, perishing in dry soil; that they perish in close, compact soil; that in the presence of food in the soil the larvae move about three inches in 24 hours, while in the absence of food the speed is about four inches; some experiments in a special glass apparatus showed that the insects could move as much as two feet in 24 hours. Further observations of this kind are in progress.

K.T. **Вредители и борьба съ ними въ лѣсничествахъ Тамбовской губ. въ 1912 г.** [Pests and the fighting of them in the forests of the Government of Tambov in 1912].—**«Лѣсная жизнь и Хозяйство»** ["*Forest Life and Economy*"].—*Tambov*, 1913, no. 7, pp. 25-28.

The fighting of injurious insects was conducted in 1912 in sixteen forests of the Government, being chiefly directed against the "May beetles" (*Melolontha*), which are the most widespread and dangerous pests of forests. In nine forests the whole fight was concentrated on the collection and destruction of these beetles, the total quantity of insects destroyed being 25 tons. The insects were mostly killed in boiling water, but in one forest special ovens were dug in the earth. In another forest the beetles were boiled in water to which lime was added, and afterwards used as manure for nurseries for 1913. It was noticed that in one locality where the plantations were eaten totally bare in 1907, the previous flying year, this year they were only partly

damaged. The excavations conducted later proved that in mixed forests, plantations of young oak, birch and aspen, suffered only one-third of the injury done in pure oak plantations, when no collections were made in either. As preventive measures against oviposition by the insects, light harrowing of the soil and spraying of tobacco dust in the nurseries were tried. The latter gave no useful result.

Apart from *Melolontha*, operations were also directed against *Euproctis chrysorrhoea*, *Lymantria dispar* and *Lophyrus pini*, the larvae of which were collected and destroyed. The larvae of *Notodonta trepida* were swept by brooms from the trees and collected afterwards into pits. The larvae of *Retinia* were destroyed by cutting away the branches from the point at which they had started to penetrate, and burning them.

**Notice of Public Hearing on the Alligator Pear Weevil (Coleop).**—*Entom. News, Philadelphia*, xvix, no. 9, Nov. 1913, p. 416.

In an editorial note attention is drawn to a meeting that was to be held at the Agricultural Department, Washington, during November, to discuss the question of establishing a quarantine against avocado seeds and fruits imported into the continental United States. It appears that a dangerous enemy to avocados (alligator pears) known as the avocado weevil (*Heilipus lauri*) exists in Hawaii, Porto Rico, Mexico, and other foreign countries. The weevil lives in the seed of the avocado, and no method is known by which it may be killed without destroying the seed itself. In view of the increase of avocado culture in the United States, especially in California, it is hoped that the nvestigations now being made will lead to the discovery of a method of treatment.

Schneider-Orelli (O.). **Der gegenwärtige Stand der Reblausforschung.** [The present state of research upon Phylloxera.]—*Schweiz. Zeits. für Obst-und Weinbau, Frauenfeld*, xxii, no. 21, 10th Nov. 1913, pp. 321-325.

This paper gives shortly the work of Börner, which forms a continuation of the researches made recently in Italy and France upon the life-history of the vine louse (*Phylloxera vastatrix*.) The work upon the subject by Marchal and Feytaud is given fully in the "Revue de Viticulture" (vol. xi, p. 5). The present paper shows that the winged louse and the gall-louse, in the majority of cases, play no part in the spread of the pest on European vines; and that the wingless root-louse can multiply indefinitely, giving rise to numerous generations without the intervention of a sexual generation, as occurs in American vines.

Marchal (P.). **Contribution à l'étude de la biologie des *Chermes*.** [Contribution to the study of the biology of *Chermes*.]—*Ann. Sci. Nat. Zool., Paris*, xviii, nos. 3-6, 1913, pp. 153-385, 6 pl., 74 figs.

The author has made numerous observations and experiments to ascertain the life-history of four species of *Chermes*, viz. *C. nusslini*,

*C. piceae*, *C. pini*, and *C. strobi*, the host tree of the first two being the fir, and of the last two, the pine. As regards *C. nusslini*, the author finds that it undergoes an alternation of hosts between *Picea orientalis* (not *P. excelsa*, as had been held before) and *Abies*; while *C. piceae*, which until recently was taken to be the same as *C. nusslini*, passes its whole life-cycle on *Abies*. *Chermes pini* was thought to reproduce indefinitely by parthenogenesis on the pine; but sexual reproduction taking place on *Picea excelsa*, has been discovered by Cholodkovsky. Galls of a species of *Chermes*, now thought to be *C. pini*, have been found on *Picea orientalis* in the south of Europe; recently, in the neighbourhood of Paris where *P. orientalis* is abundant, the author was able to trace the sexual generation of *C. pini* on this tree. *C. strobi*, which has been imported from America, multiplies in Europe exclusively by parthenogenesis.

Bentley (G. M.). **Bee-keeping in Tennessee.**—*Tennessee State Board Entom., Knoxville, Bull.* no. 9, June 1913, 64 pp., 56 figs., 2 sketch maps.

This booklet deals very completely with bee-keeping in Tennessee. Bee-moth is stated to be the chief of the troubles of the bee-keeper, which, in diminishing degree of importance, comprise paralysis, foul-brood, ants, cockroaches, toads, mice, and birds. The presence of bee-moth implies carelessness, for it never attacks a strong vigorous colony.

Gillette (C. P.) and Weldon (G. P.). **The fruit tree leaf-roller in Colorado.** *Fourth Annual Report of the State Entomologist of Colorado, Fort Collins, Colorado, Circ.* no. 7, Sept. 1913, pp. 30-67, 9 figs.

The female moth (*Archips argyrospila*, Walk.) deposits her eggs in compact oval clusters of from twenty-five to more than one hundred. The first larvae emerge with the bursting of the apple leaf buds, and when the blossom buds begin to show their pink colour the eggs are nearly all hatched. The apple is chiefly attacked. Plum, cherry, and pear trees suffer less, and the peach is practically immune; but when food is scarce the larvae will attack any green foliage. The history of the leaf-roller in the Cañon City Section is then given by A. S. Taylor. First noticed in the spring of 1908, its ravages rapidly increased, and according to data available in August 1912, the crop on the south side of the river was damaged fully 85 per cent. The north side promised nearly a full crop, but was found to be badly damaged at picking time. The eggs were not destroyed by very strong solutions of lime and sulphur used in 1910 and 1911; 7 lb. of lead arsenate in 100 gallons of water could not save the fruit, though it saved some of the foliage; miscible oil seems to have solved this serious problem at last.

The main report then continues with a comprehensive list of insecticides, tables of the insectary experiments carried out with them, and detailed notes to supplement the tables. These experiments resulted in the following conclusions:—

(1) Leaf-roller eggs possess a remarkable resistance to injury by practically all well-known contact sprays; (2) lime and sulphur preparations, either home-prepared or of commercial manufacture, give little, if any, benefit, even when used in excessive strengths; (3) kerosene emulsion containing $16\frac{2}{3}$ per cent. oil, or more, usually kills the eggs, but under certain conditions, which cannot be explained, higher strengths may fail to do so; on the other hand, a weaker strength will often do the work well; (4) a thick coating with a lime whitewash will keep the larvae from emerging from the eggs; it must be sufficient to cover the surface of the egg-mass entirely; (5) "Black Leaf 40," "Nicofume," and other tobacco preparations, used alone or with soap, were of no value; (6) strong arsenical sprays used to coat the egg-masses may be of some benefit, but probably not enough to justify their use; (7) whale-oil soap, lye, corrosive sublimate, Cooper's "V. Tree Spray," "Aphine," and hydrocyanic acid gas gave little or no protection.

Abundant notes of orchard experiments follow. From them the authors conclude that:—

(1) The leaf-roller eggs may be killed by a very thorough spraying with a soluble oil while the trees are dormant; this spray should probably be applied prior to, but as near hatching time of the eggs as possible; (2) very careful and heavy spraying with arsenicals early in the season will result in almost complete control; the first application should be made shortly after the eggs begin to hatch, which will be when the first green foliage is showing on the trees, and the second as soon as the blossom buds have separated in the clusters; a blossom spray is, in all probability, not necessary, and is dangerous, in that it poisons the bees; (3) "Black Leaf 40" carefully and thoroughly applied about the same dates as the first two sprayings with arsenicals, will give good results; (4) a mixed spray of "Black Leaf 40" and lead arsenate is little more satisfactory than either one of the insecticides used alone; furthermore, the cost of such spray would be too great for practical purposes; (5) 3 lb. lead arsenate to 50 gals. of water is sufficient for successful control, and there is no advantage to be derived from mixing Paris green with it, as many have done; (6) not less than ten gallons of spray, on an average, should be applied to trees from twelve to twenty years of age; very large trees may require even more; (7) failure to control this pest with arsenicals has been due in most cases either to a failure to spray early enough and at the correct time, or to put enough of the liquid on the trees.

MOORE (H. W. B.). **The Planters' Insect Friends.**—*Timehri, Jl. R. Agric. Comm. Soc. Brit. Guiana*, iii, no. 1, Sept. 1913, pp. 35-42.

An account of the insect pests which attack sugar-cane in British Guiana and the various parasites which prey upon them. A paper on the same subject by Mr. G. E. Bodkin has recently been noticed in this *Review* (vol. i, ser. A, p. 139).

Barthou (—.). **Les Ennemis du Framboisier.** [Enemies of the raspberry cane.]—*Moniteur d'Horticulture, Paris,* xxxvii, no. 21, 10th Nov. 1913, pp. 248-249.

The stem of the raspberry is frequently attacked by the daddy-long-legs (*Tipula oleracea*). The larva, known as the leather jacket, devours the stem not only of raspberry canes, but of strawberries, vegetables and flowers. Carbon bisulphide may be used as a remedy, also gas-lime. The best method is said to be to collect the larvae in the neighbourhood of the plant. This should be done in the early morning when they come out to feed. Spraying with water and gas-oil emulsion is effectual, but it has the disadvantage of destroying the leaves of the plant.

Another insect attacking the raspberry is *Lasioptera obfuscata,* Macq., which produces galls on the stems, full of reddish-coloured larvae. The remedy is to cut off and burn the excrescences. The leaves are often attacked by the caterpillars of *Polia oleracea,* L. The canes should be sprayed at their base with a concentrated solution of sulpho-carbonate of potassium ; a trial spray must be made first to ensure that the concentration is not such as to harm the plant.

Moreau (L.) & Vinet (E.). **Au sujet de l'emploi des pièges à vin pour capturer les papillons de la Cochylis.** [On the use of wine-traps for capturing *Clysia ambiguella.*]—*C. R. Acad. Sci., Paris,* clvii, no. 23, 8th Dec. 1913, 1158-1160.

The traps consist of simple glasses, 8 cms. (3·2 inches) deep and 6 cms. (2·4 inches) in diameter at the orifice. They are provided with a plate of glass 9 × 12 cms., which forms a roof, and which is held above by a piece of iron wire, which serves also to suspend the traps between the vine plants. The liquid consists of wine lees, to which is added vinegar, one part to ten of wine. The glasses are three-quarters filled. The capture of the moths of *Clysia* by means of these traps is influenced by atmospheric conditions, and does not give, according to the writers, satisfactory results, in spite of the numbers, which show that 2,289 moths were caught in thirty-one traps. It does not appear to constitute a sufficient means of control, and can only be regarded as complementary to other methods.

Thompson (W. R.). **Sur la spécificité des Parasites Entomophages.** [On the specialised habits of parasites of insects.]—*C. R. hebd. Soc. Biol., Paris,* lxxv, no. 35, 12th Dec. 1913, pp. 520-521.

The operation of parasites in keeping harmful insects under control has been a considerable asset to agriculturists during the past few years. There is a tendency, however, to attribute to particular parasites too great a power of becoming acclimatised to new surroundings into which they have been artificially introduced, and the author points out that parasites are often sharply restricted to particular hosts. Also, since many undergo an alternation of hosts, the introduction of such parasites into new countries becomes still more complicated.

The author cites a case of two closely allied weevils, which are parasitised by different insects; these are *Hypera postica*, Gyl., and *H. punctata*, F. The former is infested by several parasites, among which nine are frequent and easily distinguished; three attack the eggs and six (including a fungus) the larvae and pupae. *Hypera punctata*, on the contrary, is only parasitised by three species, even when it is in the same fields as *H. postica*; these three are a Mymarid egg-parasite, a fungus, and an Ichneumon parasite of the larvae. The first two are also parasitic upon *H. postica*; the last is a specific parasite of *H. punctata*.

GIRAULT (A. A.). **Notes on a Plague of Locusts in North Queensland, and its Relation to Sugar Cane.**—*Societas Entomologica, Stuttgart*, xxviii, nos. 11 & 12, 31st May and 14th June, 1913, pp. 45-46, 49-50.

Between January and June, 1912, the author made a series of observations upon the locust (*Locusta danica*) in North Queensland. In January adult specimens were observed in swarms, apparently attracted by the lights in houses. Later in the month, at Innisfail, from the bank of the Johnstone river, quite a large progressive flight was witnessed; in an adjacent sugar plantation most of the plants withered on the next day, the leaves having been stripped of their mid-ribs. In February, the young were noticed, and at the same time many dead adults, mostly females, were found. These were found while ovipositing, with their abdomens half-buried in the earth. These adults were no doubt the last of the migrating swarms observed in January. In March the adults of the first generation were very abundant, and also all larval stages, but in April all had reached maturity. At this time injury to cane was noticeable and rather extensive. In April, eggs of some locust, probably those of *L. danica*, were found, and an egg-parasite (*Scelio ovi*, Girault M.S.) was reared from them. Later, this parasite, together with another species (*Scelio australis*, Froggatt), known to be parasitic upon the eggs of *L. australis*, was found in company with the locusts. In May and June, *L. danica* were rare, although larvae of *australis* were seen in colonies.

MARCHAL (P.). **Contribution à l'etude de la biologie du Puceron noir de la Betterave.** [Contribution to the study of the biology of the Black Aphis of Beetroot.]—*C. R. hebd. de l'Acad. des Sciences, Paris*, clvii, no. 22, 1st Dec. 1913, pp. 1092-1094.

The life-history and occurrence of *Aphis euonymi* have been given by Mordwilko. He was of the opinion that this insect, which causes extensive damage to beetroot plantations, had two plant hosts during its life-cycle—the beetroot and *Viburnum opulus*, L. or *Euonymus europaeus*, L., and that by destroying the latter trees in the neighbourhood of beet plantations, the pest could be got rid of. The present author has made further observations at Orleans and at St. Germain-des-Prés, and has found that there are yet other alternative hosts besides the two mentioned above, viz., Fusain de Japon, *Rumex*, *Chenopodium* and other wild plants, so that destroying the *Viburnum* or *Euonymus* is by no means a sufficient remedy. Moreover, the

author found that in certain cases the insect may complete its life-cycle on one or other of its hosts alone, so that although the pest may be reduced by destroying one of the host plants, it will not necessarily be exterminated altogether.

JARVIS (E.). **Notes on the Bean Fly** (*Agromyza phaseoli*).—*Queensland Agric. Jl., Brisbane,* Feb. 1913, pp. 124-125, & Mar. 1913, pp. 192-195, 2 pl.

French beans in Southern Queensland are subject to the attack of the bean fly, which is widely distributed in the Colony and does considerable damage. The female oviposits in the leaf, and the larva, when hatched, tunnels its way towards the leaf-stalk; pupation takes place in the swollen bases of the leaf-stalks.

Two small hymenopterous insects have been bred from the bean fly in sufficient numbers to suggest that they are doing considerable control work. Regarding artificial remedies, it is recommended to grow a small crop of Canadian Wonder beans to meet the first brood of flies; if found to be harbouring grubs they should be pulled up and burned without delay. All old bean plants that have ceased to be profitable should be rooted up and burned. The stems may be protected by earthing them up. It has been said that good results have been derived from growing beans in a shallow trench and applying to the soil, so as not to touch the plants, whitewash made from acetylene refuse [see this *Review*, ser. A, i, p. 191,] or lime slaked with water containing carbolic acid.

JARVIS (E.). **Pumpkin Beetles and how to destroy them.**—*Queensland Agric. Jl., Brisbane,* May 1913, pp. 326-333, 2 pl.

Cucurbitaceous plants, which would otherwise do exceedingly well in Southern Queensland, are subject to the attacks of insect enemies, which devour the foliage and flowers and frequently kill both seedlings and young plants. The worst of these insects is the Banded Pumpkin Beetle, erroneously called the "Pumpkin Ladybird" (*Aulacophora olivieri*, Guérin). Although especially partial to the leaves and flowers of cucurbits, they are found on other trees and shrubs, and doubtless have a wide range of food-plants. In 1908 they were recorded as having seriously damaged ripe cherries in New South Wales. They have also been known to destroy apples by biting through the stalks of the young fruit and causing them to fall.

At times they are present in thousands on a single pumpkin plant, a fact not to be attributed, according to the author, to gregarious habits, but to the conspicuous colouring of the beetle itself, which would attract others of its kind. The pest has been recorded in Queensland from various localities in the districts of East Moreton, Wide Bay, Burnett, Darling Downs, Port Curtis, Cook, Warrego, Leichardt, and Burke. In 1907 it was especially harmful in Southern Queensland during November; but the most serious outbreak occurred two years later, when the insect did enormous damage over a wide area of the State.

The eggs, which are yellow and large enough to be plainly visible, are laid on the surface of damp soil or immediately under it among

grass, roots, etc. The egg stage occupies from nine to ten days, the larval stage forty-one days (from 14th March to 24th April). The pupal stage is passed in the soil in an egg-shaped chamber excavated by the larvae at depths varying from one to three inches. Shortly before pupation the larvae are found to be tunnelling the bases of the leaf-stalks and boring the main stem.

Various remedial measures are suggested. The protection of the young plant is very important, as at this stage it is liable, in a few hours, to be greatly injured or even killed by a single beetle. They may be protected by covering them with mosquito-netting until they have begun to grow vigorously. Such covers can be supported by pieces of fencing-wire, bent to the shape of half circles, or more simply by a few short sticks stuck into the ground. The edge of the netting should rest on the earth, and be covered with a layer of soil to prevent displacement by wind, and to stop the beetles from crawling under it. A piece of crumpled paper hung over a young plant and supported by a stick driven into the ground at an angle, is asserted to keep the insects off by its movements in the wind. Plants should be systematically examined in the spring, and any beetles found should be killed by hand-picking. Among chemical substances which may be applied to deter the insects are mentioned the following :—(*a*) refuse of acetylene gas manufacture ; (*b*) ammoniacal gas water ; (*c*) plaster or lime impregnated with turpentine, kerosene or phenyl ; (*d*) tobacco dust ; and (*e*) Vaporite Strawson, " aperite," or other such substance containing naphthalene. These in each case should be sprinkled on the ground around the growing plant, but away from the stem, and only in such amount as to bestow a marked odour upon it.

The following poisons have been advocated from time to time, and have proved more or less serviceable :—(*a*) spraying the leaves with lead arsenate (1 lb.) or Paris green and lime ($\frac{1}{4}$ lb. of the arsenical to $\frac{1}{2}$ lb. lime) in every 50 gals. water ; (*b*) dusting the foliage with Paris green (1 lb.) mixed with flour or road dust (20 lb.) or with flowers of sulphur (one part) and lime (three parts).

When the insects occur in large numbers, it is recommended to shake them from the foliage into shallow pans containing a little water and kerosene. This method is best practised in the early morning or during a spell of cold weather, when the beetles are inactive and less inclined to fly.

In some cases the covering of young seedlings could be avoided by raising the plants in cold frames, so as to get them transplanted and well established before the first beetles appear. Old plants should be pulled up to avoid any possibility of the roots affording food for the larvae.

Other species recorded as damaging cucurbitaceous plants are the Plain Pumpkin Beetle (*Aulacophora wilsoni*, Baly), the Northern Banded Pumpkin Beetle (*A. cartereti*, Guérin), and the 28-spotted Ladybird Beetle (*Epilachna 28-punctata*, Fabr.) The remedial measures given for *A. olivieri* apply equally to these insects.

**Insects injurious to Papaw Apples in Queensland.**—*Agric. Jl., Brisbane,* July 1913, pp. 33-35.

The following observations were made during July 1913, on insect injury to papaws :—

In West Cleveland a number of orchards were visited, all showing signs of injury ; fine trees had their top leaves drooping and dead, or the main stems defoliated, and carrying a few small discoloured fruits clinging to the blackened crowns. An examination revealed the injury to be due to the presence of the larvae of *Dichocrocis punctiferalis*, which had bored into the main stem, leaf-stalks and fruit. The same species was further discovered to be injuring oranges and bananas.

The egg is deposited on the leaf-stalk near its point of junction with the main stem, or more rarely on the small fruits. The larva, when hatched, penetrates the hollow stalk and after feeding for a time on its succulent base, bores into the crown, in which it remains until ready to pupate.

Remedial measures must be of a preventive nature, as it is too late to do much good after the larvae have entered the leaves or main stem. The unprofitable food-plants of the species should be destroyed in the vicinity of the orchard, but on the other hand they should be encouraged in other parts. Spraying papaws with arsenate of lead (1 lb. to 50 gals. water) would poison newly-hatched larvae attempting to enter the plant ; this should be done just before the eggs are laid, and directed principally against the early broods. All infested fruit such as peaches, etc., should be gathered and destroyed.

The food-plants of the insect already recorded are the peach, papaw, orange, loquat, guava, custard apple, granadilla, banana, millet, maize, cassia, senna bean, *Canavallia indica*, dahlia, and castor-oil plant.

**Annual Report of the Bee-Keepers' Association of the Province of Ontario, 1912.**—*Ontaria Dept. Agric., Toronto,* 1913, pp. 72.

The various papers read at the annual meeting on November 13th, 14th and 15th, 1912, include such subjects as Federal Legislation regarding bee diseases ; inspection of apiaries in Ontario ; management of outlying apiaries ; moving outfit on motor truck ; preparing bees for outdoor wintering ; cellar wintering and spring management ; bees, poultry, and fruit ; bee-breeding.

FULLAWAY (D. T.). **A New Species of Mealy-bug Parasite** (*Aphycus terryi*).—*Proc. Hawaiian Entom. Soc.* 1911-1912, *Honolulu,* ii, no. 5, July 1913, p. 281.

The new parasite described was bred from *Pseudococcus saccharifolia* at Olowalu and Hana, Maui, by F. W. Terry, June 1909, and at Hilo, Hawaii, August 1912, by O. H. Swezey.

WILSON (H. F.). **Combination sprays and recent insecticide investigations.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.,* no. 3, N.S., 1913, pp. 9-17.

Details and results of spraying experiments are given in this paper.

The author states that the factors which led to the study of the subject are :—(1) It is the most important problem before the farmers and fruit-growers of to-day ; (2) for some one or more reasons not clear to us, our knowledge of sprays and their effects is very unsatisfactory ; (3) while our commercial insecticides are more or less stable under certain ideal conditions, the results obtained from their use are too variable for us to make definite regulations ; (4) the economy of spraying and the numerous new sprays on the market at the present time demand an entirely new investigation of the subject.

The results are summarised as follows :—Arsenite of zinc acts more quickly, and remains in suspension better than arsenate of lead, acid or non-acid ; acid arsenate of lead was superior in these respects to the non-acid ; the non-acid is slow, but finally kills ; lime-sulphur did not prove of much value as a stomach poison, and when mixed with arsenicals seems to retard their action ; lime-sulphur probably acts as a repellent to biting insects as Bordeaux mixture does against the potato flea-beetle ; very young caterpillars placed on twigs which had been sprayed with lime-sulphur did not feed, and eventually died ; half-grown larvae did feed to some extent, and when transferred to unsprayed twigs developed normally.

WINSLOW (R. M.). **The Economic side of Pest-Control.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 17-21.

For the Province, expenditure on the control of pests for 1913 is estimated at 21,000 dollars for material, 20,000 for application, and 12,500 for 25 per cent. of equipment costs.

The paper also embodies a report on the cost of manufacturing lime-sulphur at Okanagan. With material at wholesale prices and freight at car-load rates, the commercial article delivered at Okanagan Points costs about £2 7s. per 40 gallon barrel of 625 lbs. Provided the same conditions obtain, the cost of manufacturing at Okanagan is about £1 0s. 10d. When buying material in less than car-load lots it would rise to £1 8s. 10d. approximately. There would be, in addition, the cost of a hydrometer (4s. 2d.), and the first cost of the boiling plant, which on a one-barrel scale need not be over £2 9s. 5d., and might be kept as low as 12s. 6d. or 16s. 8d. The product should test about 20° Beaumé, that is, not quite so strong as the commercial one which tests 32½° Beaumé. Under proper conditions several dollars per barrel might be saved ; but on the small scale, especially with inexperience, the saving would be more apparent than real.

TREHERNE (R. C.). **Methods of taking insect records in the field.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 21-24.

Without claiming originality, the author puts forward several suggestions he has found useful. To determine percentage of infestation : select 5 typical locations in the field to be examined, and from them a typical row, tree, or plant to be inspected. Then count 50 plants, buds, fruit, or leaves, as desired, and examine carefully for

injury. Then the total number of injurious marks, divided by the total number of objects examined, multiplied by 100, gives the *percentage of infestation*. If it is wished to follow the observations by others during the same season, to observe the *progress of infestation*, stakes or markers should be used, so that the same area or ground is covered each time. Tables are given for estimating egg, larval, or adult abundance to an acre, and for making estimates on nursery stock rows, gooseberries, currants, raspberries, or such like bush-fruits, and for use with trees set on the square-planting plan, corn-hills and tomato plants. These methods may prove of practical use to the working field inspector.

RUHMAN (M. H.). **The importance of Economic Entomology as a Subject of Education.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 27-28.

It is stated that 50 per cent. of the insect pests of the United States are introduced species. The very rigid inspection of nursery stock, plants, and fruit enforced in Canada, makes it almost impossible for insect pests to be introduced through these channels, but the tradesman may leave the packing material of imported products lying about, and farmers and fruit-growers do likewise. Most of the latter have not the elementary knowledge and power of observation to make the best use of the advice now obtainable concerning the control of pests.

DAY (G. O.). **President's Address.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 29-30.

Stress is laid on the importance of Systematic Entomology in this address, the speaker pleading for the amalgamation of the economic and systematic sides of the subject.

PALMER (L. L.). **Some problems in Aphis-control.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 31-34.

There is not a single operation in the proper care of orchards that may not influence the fruit produced, and no fruit-grower can afford to allow any insect pest which, directly or indirectly, injures the quality of the product, to go uncontrolled. If the cost of production is too high, the grower must reduce it, not by neglect of any single operation, but by making one operation aid another, by more thorough work in fewer operations. In dealing with orchards infested with woolly and green apple-aphis and scale insects, it is possible to work so thoroughly as to kill the one which is doing the most damage, or the two which are of greatest economic importance, and also very effectually check the third. For instance, a spray of 1 part concentrated lime-sulphur in 9 parts water, with the addition of 1 part Black Leaf 40 to every 800 parts of solution, applied with a power sprayer and a pressure of at least 175 lb., previous to the opening of the leaf-buds in early spring, should kill all over-winter woolly aphis above ground, as well as oyster-shell scale, when thoroughly brought in contact with

the insects; but it will not destroy all the green apple-aphis eggs. For green apple-aphis 1 part lime-sulphur concentrate in 30 parts water, with 1 part Black Leaf 40 to every 900 parts solution, should be applied after the leaf-buds have just opened, and will effectually kill the greater part. An application of a 15 per cent. solution of kerosene emulsion, or Black Leaf 40, 1 part to 900, about the 10th to 15th of September, in Vernon District, will free the tree-tops of woolly apple-aphis previous to the appearance of the winged viviparous females, which probably migrate to other host plants, beyond control.

Furthermore, the author recommends ploughing a furrow on each side of the trees in the spring or early autumn. A man follows up, and with a large digger hoe, or shovel, exposes as much of crown and roots as possible within a 4-foot radius of the tree; then sprays thoroughly with kerosene emulsion, forcing the spray well into the soil about the crown and base of the tree. As the ploughing is necessary every other year, advantage is thus taken of it to make the spraying more effective. Again, by arranging to prune the trees from 1 to 4 years old in late winter or early spring, the shining black eggs of the green apple-aphis are then easily seen, and can be clipped off in the regular pruning operation. By pruning in late winter the exposure of immature wood to the cold winter weather is also avoided.

LYNE (W. H.). **Two injurious insects of economic importance attacking peach, apricot, and plum trees.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 34-36.

The method of control adopted for the peach twig-borer (*Anarsia lineatella*) consists of winter spraying with lime-sulphur 1–10, just as the buds are opening, and arsenate of lead 3 lb. to 50 galls. of water when the new growth starts. To protect the fruit from the second brood of larvae, use the arsenate spray just about the time the moths begin to fly—by the middle of July in British Columbia. In dealing with the peach root-borer (*Sanninoidea exitiosa*, *opalescens*) it is best to cut the larvae out about the end of June before they pupate. Before replacing the earth round the tree the following wash should be applied:—1 part lime-sulphur to 6 parts water, with enough fresh-slaked lime to thicken 5 gallons of the mixture to a good thick paint; into this stir thoroughly ½ lb. whale-oil soap and ¼ pint carbolic acid or 1 lb. coal tar. When the paint has had time to dry on the trees, replace the earth, banking up 4 or 5 inches. This wash will also protect from fungous rot, etc., besides making it very difficult for the young larvae to penetrate. To save cutting, fumigation of the roots with carbon bisulphide has been resorted to, but is not popular, as there is danger of killing the tree. The peach root-borer is a most injurious pest, on account of its deadly work being done unseen in the most vital part. Its presence is often not suspected until the tree dies, after the crown of the roots has been successfully girdled.

MIDDLETON (M. S.). **Cutworms and their control.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 36-37.

It would seem that epidemics of insect pests are followed by periods of comparative rest, due almost wholly to parasitic control. The

latter is considered to have checked the epidemic of cutworms prevalent in 1912 in the Kootenay, for but little damage resulted in 1913. The pests injured nearly every cultivated plant, including green grain. Vegetable gardens and orchards suffered most, while they were very destructive in cabbage, turnips, and tomato fields, and damaged strawberry beds extensively. The most common varieties are the red-backed (*Paragrotis ochrogaster*), the greasy (*Agrotis ypsilon*), the variegated (*Peridroma saucia, Lycophotia margaritosa*), and the zebra caterpillars (*Mamestra canadensis, Polia nevadae*). The Canadian list might be extended to include the following:—yellow-headed (*Hadena arctica, Aplectoides speciosa*), spotted (*Noctua c-nigrum*), brown (*Nephelades minians*), W-marked (*Noctua clandestina, unicolor*), common striped (*Euxoa tessellata*), white climbing (*Carneades* [*Lycophotia*] *scandens*), spotted legged (*Porosagrotis vetusta*), and dingy (*Feltia subgothica*). Poison bait is possibly the best all-round material for control. Use 1 lb. Paris green, 50 lb. bran, about 3 lb. sugar. First moisten the bran a little, then add the Paris green and mix well, then add the sugar as sweetened water. The bait should be considerably sweeter than the plants the larvae are feeding on. About 25–50 lb. should suffice for an acre of vegetables and fruit. Fruit trees only will require much less. Keep the mixture well away from the trees or plants to prevent them from being injured. Tanglefoot has given good results in the case of fruit trees and larger plants, and banding with cotton batten is also useful. Running chickens are very effective in an orchard. Cultivation methods assist considerably. Cover crops left over winter as a protection harbour the larvae, the eggs of which might be destroyed if the sowing of the crop were delayed a little to allow of this.

TAYLOR (L. E.). **Economic Ornithology.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 37-41.

The author summarises his remarks by stating that there is a chance of imported birds becoming a pest and upsetting the balance of nature, and that scientific societies should protest against permission being granted for the introduction of any exotic birds into the country, either from aesthetic or economic considerations. At the close of the ensuing discussion it was moved and seconded, "That this Society, in view of recent researches into the economic value of introduced birds in other countries, disapproves of the practice of granting permits for the introduction of any exotic birds into this province." This was carried unanimously.

SWAINE (J. M.). **The economic importance of Canadian Ipidae** [*Scolytidae.*]—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 41-43.

The genus *Dendroctonus* contains a number of species most injurious to conifers; *D. piceaperda*, Hopk., has killed an immense amount of the finest spruce timber in Maine and New Brunswick. *D. valens*, Lec., is commonly found in dying bark of spruce and pine logs, and not rarely is the primary cause of the death of the trees. In British

Columbia it is assisting *D. brevicomis* in killing bull-pine. An undescribed species of *Dendroctonus* breeds in the fire-injured timber of Manitoba, and has killed jack-pine, mostly near the burns. *D. simplex* breeds in dying larch-bark from Manitoba eastward, and apparently kills many trees weakened by the larch sawfly. Another undescribed *Dendroctonus*, assisted by species of the genus *Ips* (*Tomicus*), is apparently killing much white spruce along the Athabaska river. *D. pseudotsugae*, Hopk., everywhere kills injured and weakened trees, and frequently much green timber. *D. monticolae*, Hopk., has killed many western white pines (*Pinus monticola*) in the Sugar Lake region of British Columbia, and the outbreak is still spreading. It also kills the black pine there. *D. engelmanni*, *D. borealis*, *D. murrayanae*, and *D. obesies* are variably destructive to spruce and pine in the Province. Many species of genus *Ips* (*Tomicus*) are abundant in dying bark of pine, spruce, and larch. They are mostly secondary enemies, seldom attacking green timber. Some species, however, are injurious to pine and spruce in British Columbia and Alberta, and *Ips balsameus*, Lec., is a serious enemy to balsam fir throughout Ontario, Quebec, and New Brunswick, also injuring larch to a lesser degree. *Polygraphus rufipennis*, Kirby, and allied undescribed forms are everywhere important secondary enemies to pine, spruce, and larch. Several species of *Phloeosinus* are locally injurious to cedars. Certain twig-beetles of the genus *Pityophthorus* at times become sufficiently numerous to check and, rarely, kill the infested trees. Such injury was abundant on jack-pine in northern Ontario, and bull-pine in British Columbia. Belonging to this group are the peach-tree bark-beetle (*Phloeotribus liminaris*) and the fruit-tree bark-beetle (*Eccoptogaster rugulosus*) which are important pests in southern Ontario, and the former breeds also in the wild cherry in Quebec Province. The clover bark-beetle (*Hylastinus obscurus*, Marsh.) is injurious to red mammoth, alsike and crimson clovers in parts of Quebec and Ontario. The deciduous trees of Canadian forests suffer less from this family. Ambrosia-beetles, do not, as a rule, attack sound timber ; in British Columbia their injury is only noticed in felled timber left out of water, or in fire-injured trees.

P. F. **Die Bekämpfung des Heu- und Sauerwurms mit Nikotin während des Jahres 1913.** [The use of nicotin against the vine moth in 1913.]—*Luxemburger Weinzeitung, Grevenmacher*, i, no. 29, 1st Nov. 1913, pp. 499-506.

A Bordeaux mixture was used, and to it were added 1½ parts soap jelly and 1½ parts of Evert's tobacco extract (10%) per 100 parts spray. Eight reports were dealt with. Three stated there was no foreign taste in the must, two reported a bad taste, and the remaining three a very bad one. Too strong a percentage of nicotin (4%), and in one case the admixture of casein, are supposed to account for this. Several experimenters suggested that the copper was the cause and not the nicotin. Particular stress is laid on the fact that the successful use of poisons can only be expected when the vineyard is at the same time efficiently protected against *Oidium* and *Peronospora*. Nicotin is most advantageously employed when the flight of the moths is at its height.

Spraying must be carefully and thoroughly carried out, otherwise it is best not to incur a useless outlay. Nicotin will keep for years if packed in air-tight containers.

WILLIAMS (B. S.). *Hadena oleracea* **destructive to Tomatoes.**—*Entomologist, London,* xlvi, Dec. 1913, p. 333.

In a short note, attention is drawn to the fact that *Polia* (*Hadena*) *oleracea,* L., has done great injury to tomatoes all over England. The only remedy seems to be to collect the larvae by hand, and to take off the top layer of soil, when the insects are in the pupal stage, and burn it, both of which processes involve considerable labour. Being under glass, the insects are protected from birds, and apparently from parasites also. Fumigation had not been tried.

FRIEDRICHS (K.). **Ueber den gegenwärtigen Stand des Bekämfung des Nashornkäfers** (*Oryctes rhinoceros,* **L.**) **in Samoa.** [On the present state of the campaign against the Rhinoceros Beetle in Samoa.]—*Der Tropenpflanzer, Berlin,* xvii, nos. 10, 11, 12, Oct.-Nov.-Dec. 1913, pp. 538-558, 603-619, 660-675, 19 figs., 2 sketch-maps.

The prosperity of Samoa is so largely dependent on the coconut palm that the control of the Rhinoceros Beetle constitutes a problem of the very highest importance. Where the Government has taken immediate and energetic measures, the pest has been reduced, but on the whole there has been an increase. The planting district around Apia has suffered most, as the beetle has undisturbed opportunities for breeding in the cacao and Hevea plantations, and the coconut palms being there comparatively few in number, serve as an attraction for countless beetles. The coast belt, being owned mostly by natives, who prosecute weekly searches, does not suffer so much.

The direction in which the pest spreads is generally determined by the prevailing wind. It was introduced with Hevea plants brought to Apia from Ceylon, and traces of its ravages were first noticed in 1910. On the east coast the damage is not very apparent, but the trade winds on the west coast have caused a rapid spread. The bush palm (*Cyphokentia samoensis,* Warb.) also provides the insects with food, but it is not feasible to combat the pest in the bush.

*Protection of the Palms.* Vosseler says that coarse-grained sand keeps off the beetle. This may be useful in the angles of the leaves, but does not protect the yet unopened leaves, which suffer most. Labour charges would also be heavy, as it is necessary to climb the palms in order to apply the sand. The tropical rains will also soon wash it away ; experiments are being made with tar, as a protection for the young leaves, but it seems possible that it may prove injurious to the plants. Should a mixture of tar ($\frac{2}{3}$) and petroleum ($\frac{1}{3}$) reach the growing point through a bore-hole, it will kill the palm. Though this mixture was considered to be excellent by a local planter, the author saw numerous trees destroyed in this way on one plantation. It has not yet been ascertained if tar alone acts in this way.

*Control by Collection.* In the early morning, workers provided with a metal case and heavy knife search all rotten wood, heaps of leaves, etc., which may harbour the beetles. Every native must bring in a minimum number fixed by the village chief. About 9 o'clock the count is made and destruction effected by fire or boiling water. At the present time this collecting is the most efficacious measure. But the natives often render it illusory, either by gathering in special likely places instead of on their own plantations, or by robbing the trap heaps got together by the Government workers. Also they probably breed beetles for the purpose. But in spite of this, collecting remains a valuable aid.

*Decoy Methods.* Light has been used, but without much success. The author thinks it is only useful as an aid to other decoy methods. He has also experimented with toddy, but cannot report favourably on its usefulness as a means of attracting the beetles.

Trap heaps were employed as soon as the pest appeared, and much money was expended on them. Groups of 10 to 20 natives, under white supervision, erect heaps of old wood (especially pieces of palm trunk), leaves (especially of the banana), and earth. The lower part of the pile is in a trough, the upper part stands above the soil level. The total height is about 20 inches, generally less. Smaller heaps composed of leaves only have been used, but are being abandoned, as the natives turn them over. Cacao pods are buried in some plantations and make good traps. The heaps are turned over every six or eight weeks. This frequent search ensures the discovery of nearly every larva. Both females and males are found in these heaps; of 1,000 captured beetles 566 were females and 434 males, but the proportion varies considerably.

At present there are about 600 heaps, and in 1912, 11,300 beetles, 220 pupae, nearly 776,000 larvae and over 180,000 eggs were collected. In round figures, about a million pests were caught at a cost of 28,000 marks (£1,400), which works out at a little over 1 farthing each.

The author is of opinion that at present this method is as useful and as necessary as in the past. It has been shown that the application of carbon bisulphide to the heaps is effective, and the poison need only be used every 3 months; the cost would be less than that of digging up the heaps.

Besides carbon bisulphide a number of other substances were tried. Saltpetre gave really good results. It can be used with buried cacao pods; garden beds can be manured with it; trap heaps—which are no longer required as such—can be treated with it; it can be used on tree-trunks and roots.

*Removal of breeding places.* This is a most important measure. Dead palm-wood is always dangerous, and by boring a hole in the trunk and filling it with saltpetre, the latter will gradually permeate the wood. How long this action will be useful is still an open question. It is quite clear that by careful cleaning of the plantations the pest can be reduced.

*Natural enemies.* One of the reasons for the spread of the pest in these islands is the lack of natural enemies. The semi-wild pigs of the natives are not at all to be despised in this respect, and are already used for this purpose. Attempts have been made to introduce the

mole (*Talpa europaea*), but it is difficult to do so. Hedgehogs soon succumbed to the climate. Fowls and other birds are not of much use.

The author examines at length the question of parasites, and comes to the conclusion that parasitic wasps appear to be of greater importance than all the other enemies of this beetle. He mentions, amongst others, *Scolia carnifex*, Coq., and *Scolia oryctophaga*, Coq., as apparently specially suitable, if their introduction can be effected on a large scale.

But all animal enemies appear to yield in importance to a parasitic fungus (*Metarrhizium anisopliae*), which occurs in the islands, and evidently has other hosts besides the Rhinoceros Beetle. When the author first had a large number of larvae delivered to him, he noticed brown spots on some of them. Having isolated these, they died in about a week and became completely covered with this fungus. Healthy larvae were brought in contact with the bodies, and all succumbed. Practically all the larvae in the laboratory became infected, and died. The fungus thrives best in moderately damp cultures. A trap heap of leaves and rubbish infected with the fungus, has conserved its deadly powers for several months, up to the time of writing, and has been fatal to every brood in it. The fungus does not prevent the beetles from laying their eggs there, which is a most important point. The fungus also spreads in the neighbourhood of the heap. Experiments have proved that the flying beetles can carry it to other breeding grounds. As the thoroughly infected heaps would only require a simple examination once every 3 months (later on once every 6 months), the number of heaps could be increased tenfold. The best method is to use cacao pods buried under a layer of earth. Quite fresh pods should not be used. The fungus is already in satisfactory use on the plantations, and planters have begun to assist its spread. A lengthy bibliography of pests of the coconut concludes the paper.

Von Graumnitz (C.). **Die Blattschneider-Ameisen Südamerikas.** [Leaf-cutting Ants of S. America.]—*Internat. Entom. Zeits., Guben*, vii, no. 35, 29th Nov. 1913, p. 233, & no. 36, 6th Dec. 1913, pp. 240-242.

The leaf-cutting ants, *Atta discigera*, *A. coronata* and *A. hystrix*, are very prevalent in parts of Brazil. The present paper gives a description of their leaf-cutting habits and the structure of their nests. The trees which they most persistently attack are the orange and peach, and in the vegetable garden, the cabbage and allied plants; they attack also ripe bananas, maize, rice, etc. They do not use the leaves directly as food, but allow them to rot and thus produce a favourable medium for the growth of the fungus, *Rozites gongylophora*, which is their staple article of diet. The nests are underground, and are built on a very complicated and ingenious plan; the eggs are laid in the decaying leaves, which form a large porous mass in the nest, rather like a sponge. In this mass are found eggs, larvae, and pupae in all stages of development; the fungus growing on the leaves serves as food material for the larvae as well as for the adult ants. The ants cultivate this particular fungus very carefully, destroying any other kinds of fungi which make their appearance. It is quite common to find snakes' eggs amongst the leaves; the warmth given out by the

decomposing mass makes it a suitable place for this purpose ; among others, the eggs of *Elaps corallinus* have been identified.

RUGGLES (A. G.). **Notes on a Chestnut-tree Parasite.** —*Science, Philadelphia*, xxxviii, no. 989, 12th Dec. 1913, p. 852.

While working in connection with the Pennsylvania Chestnut Tree Blight Commission last winter, the author noticed numerous burrows which were almost always present in the bark of the chestnuts, particularly in the smooth-barked trees. He was satisfied that the burrows were not the work of *Agrilus bilineatus*, as had been suggested by Metcalf and Collins in the U.S. Farmers' Bulletin, No. 467. They eventually proved to be due to the larvae of a small moth, which hibernate in the burrows in either the second or third instar. When finished, the burrow is not very extensive, the longest being not more than six inches, and extending longitudinally. While the insect is within the trees the burrow cannot be detected externally. After the emergence of the larva, however, the bark swells over the burrow, often cracking and making a conspicuous wound. The larvae leave the trees during the first part of June through minute exit holes, dropping to the soil, in which they spin a seed-pod-like cocoon, characteristic of some of the Microlepidoptera. The single perfect insect obtained was in too injured a condition to be identified. The number of exit holes made by these insects is enormous in any given area of chestnut forest, and as these holes are made just at the time when the blight spores are very abundant, and conditions generally are favourable for their development, it is believed that this insect has an important bearing upon the spread of the chestnut blight, *Eudothia parasitica*.

DOANE (R. W.). **The Rhinoceros Beetle—(*Oryctes Rhinoceros*, L.) in Samoa.**—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 437-442, 2 pl.

The Rhinoceros Beetle, *Oryctes rhinoceros*, L., has long been known as a more or less serious pest of coconut trees in many tropical countries. It is gradually extending its range, and wherever it gains a foothold in a new country its ravages usually cause great financial loss. The island of Upolo, German Samoa, is one of the recent places to suffer from the introduction of this pest. In districts where the infestation is worst, hundreds of trees are being killed on many of the plantations, and many others badly injured. As the beetles attack the most vital part, the succulent crown, one or two will quickly kill a young tree. Older trees are better able to withstand attack, but even a few beetles in them will soon make them unproductive. The beetles usually attack the tree between the base of a leaf and the trunk, or between the bases of two leaves. Having reached the tender heart of the tree, the beetles feed on it, probably for some weeks, often destroying much or all of it, thus killing the tree.

The life-history of the insect has not been thoroughly worked out, but in Samoa it probably takes a year to complete its development. The eggs, which are laid in batches of 10–30, hatch in a very short time, and the larvae feed for several weeks, possibly for some months.

The pupae are rarely seen, and never in considerable numbers ; many of the larvae probably pupate at some distance below the surface of the ground. The pupal stage lasts for about 10 days to a fortnight.

In Samoa many control methods have been tried. In the author's opinion, tar is the most valuable repellent, but its use gives only a small measure of protection. Trees treated with lysol, or lysol mixed with tar, continued to be badly injured. Sand was poured into the crowns of a few trees, and on others a mixture of sand and arsenic, care being taken that plenty lodged at the bases of all the leaves. The arsenic injured the leaves ; otherwise the trees were not badly attacked, but there was not sufficient time to test this method thoroughly. Dusting with white arsenic, Paris green, etc., is not satisfactory, owing to the fact that the beetles do not swallow the leaves or fibre. Pouring carbon bisulphide into the holes made by the beetles, killed the beetles, but also injured the tree. Bait traps, if carefully prepared, are quite effective on well-cleaned plantations, but they are expensive and require close supervision. For the present, the most effective method is to destroy the breeding places of the beetle by removing all decaying logs, etc., from the plantation. [See above, pp. 26–28.]

Wolcott (G. N.). **Report on a Trip to Demerara, Trinidad and Barbados during the Winter of 1913.**—*Jl. Econ. Entom., Concord*, vi. no. 6, Dec. 1913, pp. 443-457.

In Demerara the small moth-borer (*Diatraea saccharalis*, F.), and the closely allied species, *D. lineolata*, Walk., and *D. canella*, Hmp., are the most serious pests of cane. On nearly every estate there are gangs of boys, sometimes as many as 50 in a gang, who do nothing else the year round but cut out the dead hearts killed by the *Diatraea* larvae. It shows how serious the pest is that the boys have no difficulty in collecting 700 larvae day after day. The problem of controlling *Diatraea* is most seriously complicated by the dry and wet seasons. There are always two, and sometimes four, wet seasons and as many dry. Cane is cut towards the end of each dry season, and seed cane is planted at each wet season. A crop takes 18 months to mature, so that cane in all stages of growth is present on a single estate at all times. Moths will fly out a hundred yards or more from the older cane and deposit eggs on the young cane from which all the dead hearts have just been cut out, and in a few weeks the infestation will be as heavy as if no control had been attempted. In Demerara there are four insect parasites of *Diatraea*, but in spite of these, and of the artificial control, *Diatraea* still remains a serious pest. The one measure that can be adopted is the simultaneous planting of enormous blocks of cane ; it is the indiscriminate scattering of the fields of all ages of cane on an estate that makes possible the rapid and easy infestation of young cane.

The only other serious cane pest in Demerara is the giant moth-borer (*Castnia licus*, F.). The larva enters the cane near the ground and burrows down into the root and up into the stalk. There are fortunately several practical methods of control. They are as follows : (1) Collecting the adult moths in butterfly nets ; (2) cutting out the young larvae in the young ratoon cane ; (3) cutting out the older

larvae and pupae from the stools of cane after the crop has been harvested ; (4) in the case of very heavy infestation, the flooding of the entire field after the cane is cut.

Much cane is also injured by termites ; they never attack sound cane, but as all the cane in Demerara is infested with *Diatraea*, the termites have no difficulty in finding a place of entrance into the interior of the stalk. The method of control adopted consists of carrying the nests away and burning them. The sugar-cane mealy bug (*Pseudococcus calceolariae*, Mask.), was moderately abundant, but it is not considered a serious pest; it is kept in check by a predaceous beetle, the name of which has not been determined.* [See this *Review*, Ser. A, i, p. 521.]

In Trinidad the most injurious pest is not *Diatraea*, as it is in practically all other sugar-producing countries of the West Indies, but a froghopper (*Tomaspis varia*, F. [*saccharina*, Dist.]). It passes through its larval stages underground, feeding upon the roots of cane, grass and weeds ; the adult sucks juice from the leaves and stalk of the cane, but produces no serious injury.† Despite the small size of the nymphs, the enormous numbers in which they appear on the roots of the cane, either kill the cane outright, or so stunt the growth that the crop is worthless. The control of this pest is rendered the more difficult because of the lack of vulnerable places in its life-history. As all ordinary methods of control are impracticable a novel plan of campaign has been adopted. This depends on the circumstance that the fungus *Metarrhizium anisopliae*, Sorokin, produces a fatal disease among froghoppers called Green Muscardine. Planters cultivate this fungus, and at certain seasons dust its spores over the entire fields ; although this method is of too recent origin to have borne the test of time, it is already stated that in one examination made by Mr. Urich, where spores had been applied early, at least 95 per cent. of the nymphs in the stool of the cane were found dead and covered with the characteristic spore-masses of *Metarrhizium*. *Castolus plagiaticollis*, an efficient predator on the adult froghopper, has been imported from Mexico. Two Chalcidid parasites have been bred by Mr. Guppy, Mr. Urich's assistant. *Castnia licus* does great injury to canes in Trinidad. The only practicable method of control is the catching of the adults with butterfly nets ; this has produced good results. Among the more important minor pests are the weevil stalk-borer (*Metamasius hemipterus*, var. *decoloratus*, Gyl.), the "gru-gru" worm (*Rhyncophorus palmarum*, L.) and the sugar-cane mealy bug (*Pseudococcus calceolariae*, Mask.)

In Barbados the froghopper and the larger moth-borer are absent, but otherwise the insect pests are similar. *Diatraea* does an enormous amount of injury ; both kinds of the sugar-cane mealy bugs (*Pseudococcus calceolariae*, Mask., and *P. sacchari*, Ckll.) are abundant. *Delphax saccharivora*, Westw., the sugar-cane leafhopper, and *Metamasius hemipterus*, L., the weevil stalk-borer, also do considerable damage. With the exception of *Diatraea*, however, all these are minor pests in

---

*[Specimens of this Coccinellid, sent by Mr. G. E. Bodkin, from Demerara, and by Mr. J. R. Bovell, from Barbados, have now been identified as *Hyperaspis trilineata*, Muls.—Ed.]

†[This view is disputed by Mr. J. C. Kershaw, who has just devoted a year to the special study of this insect.—Ed.]

comparison with the injury produced by the weevil root-borer (*Diaprepes abbreviatus*, L.) No effective method of control is known, but the numbers of the grubs can be considerably reduced by hand-picking of the adults, which collect in large numbers on corn and sorghum. The insect eats most of the small roots and chews the centre out of the main tap-root. As regards *Diatraea*, *Trichogramma minutum* is its only parasite in Barbados. Another interesting pest, from the point of view of those interested in parasitism, is *Phytalus smithi*, which is parasitised by a black Scoliid wasp, *Tiphia parallela*, Smith. *P. smithi* occurs also in Mauritius; it was probably introduced there in cane sent from Barbados. Until now the controlling parasite, *T. parallela*, was not present in Mauritius, but efforts are being made to import it.

WILSON (H. F.). **Notes on** *Podabrus pruinosus*.—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 443-457, 1 fig.

This insect is one of the most important agents in the control of all forms of plant-lice. It has been very abundant in the Willamette Valley, Oregon, during the past two years. The rosy apple aphis (*Aphis sorbi*, Kalt. ?), the black cherry aphis (*Myzus cerasi*, F.), and the vetch aphis (*Macrosiphum pisi*, Kalt. ?) are held in check by this insect. The adults appear early in May, and are abundant by June. By July only a few individuals are found. They are commonly found in vetch fields, and in the rolls of infested apple and cherry leaves. They undoubtedly destroy many aphids in a day, and are of great economic value.

The eggs were not observed in the field, but in the insectary they were deposited on the ground in masses. The larvae are found in the ground from 3–6 inches below the surface; they are pink in colour and covered with fine hairs. The pupae are found in earthen cells in the moist earth; at first they are white, then they change to pink, and then to dark blue. The adults are dark blue with light brown markings.

HINDS (W. E.). **Powdered Arsenate of Lead as an Insecticide.**—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 477-479.

The use of powdered arsenate of lead is said to have given very satisfactory results as an insecticide; the statement is the result of experience, and direct experiment made in the Agricultural Experiment Station at Auburn, Alabama. It has the advantage over the paste preparation in that it weighs much less, and, therefore, the cost of transport is less; it is not liable to harden and cake, as the paste is; and it is not so difficult to work up into a uniform suspension in water for spraying. Over Paris green it possesses the great advantage of not causing skin injury to the men using it. The Department of Entomology of the Alabama Experiment Station is now making an investigation covering the use of various forms of arsenate of lead, with a view to finding exactly what form is most effective, economical and generally satisfactory for use against various insect pests. For the present there is no reason why anyone should hesitate to use powdered arsenate of lead in preference to Paris green or any other arsenical poison.

Felt (E. P.). *Arthrocnodax carolina*, n. sp.—*Jl. Econ. Entom., Concord,* vi, no. 6, Dec. 1913, pp. 488-489.

Mr. E. A. MacGregor, who reared this species both in 1912 and 1913 from red spiders on cotton, is of opinion that it is the most important natural agent in controlling this pest. The new species is allied to *A. apiphila*, Felt, and is distinct from *A. occidentalis*, Felt, which is recorded as preying upon red spiders in California.

**Amendment to "The Destructive Insect and Pest Act of Canada."**

In line 14 of Regulation 3, the words " Importations by mail shall be subject to the same Regulations," have been deleted, and a new Regulation, No. 18, has been added, reading :—

" 18.—The importation of all nursery stock, including trees, shrubs, plants, vines, grafts, scions, cuttings or buds, through the mails, is prohibited, excepting greenhouse-grown florists' stock, cut flowers, herbaceous perennials and bedding plants, which will be admitted provided that a detailed statement of the contents is attached to such parcels."

This Regulation takes effect on and after the first day of March, 1914.

Sudeikin (G. S.). **Вредители сельско-хозяйственныхъ растенiй Воронежской губернiи, по наблюденiямъ 1912.** [Pests of agricultural plants in the Government of Voronezh, according to observations made in the year 1912.]—*Published by the Zemstvo, Voronezh,* 1913, 68 pp.

This is a report of the Government Entomological Station of Voronezh, which was only inaugurated in May 1912.

*Insects injurious to crops.*—*Caloptenus italicus*, L., appears periodically, and is very widespread, but last year there were fewer complaints of its activity. *Anthothrips aculeatus*, F., and *Limothrips denticornis*, Hal., were found in some districts ; the remedy suggested is to keep the fields clean from weeds, and to plough-in the stubble in which the insects winter. For *Aelia acuminata*, L., the following remedies are recommended : hand-picking, catching the young (wingless) specimens in trenches (containing bait-holes) ; surrounding the fields and spraying with soap water or naphtha emulsion at dusk or during moonlight nights.

*Aphis gossypii*, Glov., is specially injurious to Cucurbitaceous plants. Remedies : (1) repeated spraying with soapy water (1 lb. green soap, ½ lb. ordinary soap, and 2·7 gals. water) every 10 days from the moment of the appearance of the insects till the time of oviposition ; (2) destroying by burning all attacked plants ; (3) frequent re-ploughing of the infected areas during autumn and spring ; (4) rotation of crops ; (5) the removal and burning of all stalks and leaves after the harvest. The boring of grain by the larvae of *Sitotroga cerealella*, Ol., and *Tinea granella*, L., in stores, as well as in the fields, is very frequent. Remedies : (1) the immediate disinfection of the storehouses by carbon bisulphide ; (2) the sorting of the seeds by winnowing in autumn and spring before

sowing, as well as after thrashing, and burning or giving to cattle the winnowed seeds; (3) careful and deep planting of the seeds when sowing maize; (4) the destruction of the lumpy stratum formed by the caterpillars on the top of heaps of grain.

*Phlyctaenodes sticticalis*, L., appears yearly, doing more or less damage. Last year the caterpillars in some parts totally devoured the sunflowers, maize, pumpkins, melons and cucumbers. The caterpillars of *Homoeosoma nebulella*, Hb., do considerable damage to sunflower seeds. *Plusia gamma*, L., injures many cultivated plants, principally beets and linseed, but last year there were practically no complaints of its activity.

*Lema melanopa*, L., has done considerable damage to oats, barley, and summer-sown wheat, during the latter half of June and the beginning of July. As remedies are recommended: (1) shaking the insects off the oats with brooms in the mornings, after which the attacked spots must be dusted with ashes or lime through a sieve; (2) the spraying of three per cent. solution in water of barium chloride or Paris green (1 oz. green and 3 oz. freshly slaked lime in 6 gals. water); (3) summer sowing instead of winter sowing, or the earlier sowing of summer crops. *Psylliodes attenuatus*, Koch, *Chaetocnema concinna*, Chevr., and *P. breviuscula*, Fald., have damaged hemp seeds and beets. As a remedy "a tanglefoot cart" is suggested, consisting of a board on wheels, smeared on the lower side with molasses or pitch, to be wheeled over the plants during the hot hours of the day, so as to catch the insects when they jump.

*Calandra granaria*, L. In an appendix to the report the campaign against this pest in the municipal grain stores of Voronezh is described. Carbon bisulphide has been used successfully, and it has been noticed that this remedy gives better results in warm weather than during cold or windy weather. The germinating capacity of the grain is not affected if the proportions do not exceed about 1 lb. of bisulphide for each ton of grain. *Lethrus apterus*, Laxm., damages various young plants, and particularly sown sunflower seeds. The following remedies are given: (1) trenches round the plantation; (2) spraying with Paris green; (3) ploughing the infected plots in autumn or early spring, and keeping them clear from weeds to the end of May; (4) hand-picking.

*Anisoplia austriaca*, Hbst., is very widespread in the Government. The usual remedy consists in hand-picking, the insects being driven by a rope to one end of the field, where they are at once picked up by men with sacks. The Zemstvo pays a premium for the collection of this insect, and the author suggests that this ought to be encouraged and properly organised. The insect usually begins by damaging the ears of winter-grown crops, passing afterwards to barley and summer-sown wheat. The beetles oviposit in July on the borders of the fields, so that the ploughing of these parts in August would lead to the destruction of the eggs and of the young larvae.

*Mayetiola* (*Cecidomyia*) *destructor*, Say, is a serious pest of grain, and is found everywhere in the Government. The remedies usually applied are ploughing, burning of the stubbles and trap-crops.

The larvae of *Bibio hortulanus*, L., damaged sugar-beets in one locality; as remedies are suggested: the complete removal of the

remains of the harvest from the plantations ; harrowing the infested plots in autumn or early spring, after spreading quicklime ; and spraying in early spring with a 4 per cent. solution of Chile saltpetre. *Hylemyia coarctata*, Fall., has done considerable damage to winter rye in one locality. *Oscinis frit*, L., is widespread, and often mistaken for *M. destructor*; it has damaged barley and black barley in some places. To fight the insect the author recommends : (1) to sow summer crops as early as possible, and use seeds which tiller less ; (2) to place the seeds at a uniform depth, so that the sprouts should appear simultaneously ; (3) not to allow the summer crops to get over-ripe ; (4) to replough the stubbles immediately the harvest is over ; and (5) not to sow summer crops near the damaged winter ones.

*Orchard Pests.—Tingis piri*, Geoffr., is found everywhere, and damages apple, pear and cherry trees, from July to September. Repeated sprayings with soap water ($\frac{1}{4}$ lb. ordinary soap in 2·7 galls. water) kills the insects. The autumn cleaning of the orchards from the fallen leaves and the burning of all waste is also recommended.

*Pyslla mali*, Först., has been proved to exist in several districts, and in the opinion of the author, probably occurs in all the others, although growers do not notice its presence, and attribute the injury done by it to frost. Repeated and abundant spraying of the trees in late autumn and early spring with 3–5 per cent. solution of green copperas when the larvae appear ; spraying with tobacco or quassia extract ; and burning the small branches cut away in autumn and spring, are the remedies suggested.

*Psylla pyricola*, Först., *Aphis pomi*, de G., *Myzus cerasi*, F., *Hyalopterus pruni*, F., and *Rhopalosiphum ribis*, Buckton, are found everywhere, and were successfully controlled by spraying with soapy water. *Lepidosaphes ulmi*, L., *Mytilaspis pomorum*, Bouché, and another unidentified Coccid were very widespread on apple trees. Amongst the suggested remedies are : spraying and smearing of the leafless trees in autumn and spring with limewash, containing 2–3 wine-glasses of crude carbolic acid or 1 lb. of green copperas to 2·7 galls. of the solution ; the intensive manuring of the attacked trees ; the pruning of the crowns ; spraying with carbol or naphtha emulsions in May, June, etc.

The author considers that *Hyponomeuta malinellus*, Z., takes the first place amongst the pests of orchards in the Government. Its caterpillars are most active throughout June. The best remedy is spraying with tobacco decoction (a handful of tobacco to each 2 gals. of water), which must be done when the caterpillars are still young and have not yet prepared their webs. It is also useful to spray the leafless trees abundantly and repeatedly in autumn and in spring, before the swelling of the buds, with a 5 per cent. solution of sulphate of iron ; to burn the thin branches cut away from the trees ; and especially to spray the crown with milk of lime to which sulphate of iron is added (1 lb. of sulphate to each 2·7 galls. of the solution). *Hyponomeuta variabilis*, Z., flew in great numbers near the town of Voronezh at the beginning of August, the larvae mining the leaves of cherries.

There was only one generation of *Cydia* (*Carpocapsa*) *pomonella* in

1912 ; although in June and July the caterpillars occurred everywhere in fruits, no pupae or moths of the second generation were found.

*Cydia funebrana*, Tr., also damaged plums ; the liming of the stems, the shaking down and collection of the wormy plums, and the digging up of all brushwood near the trees in autumn and in spring, are the remedies recommended. The caterpillars of *Bembecia hylaeiformis*, Lasp., injured the stems of raspberry bushes ; the most effective remedy is to dig out the injured stems with the roots in autumn and to burn them. There were complaints from various districts of damage to fruit trees by *Cossus cossus*, L., and *Zeuzera pyrina*, L.

The larvae of the following Lepidoptera are recorded as causing serious defoliation of fruit trees :—*Aporia crataegi*, L., *Malacosoma neustria*, L., *Lymantria dispar*, L., and *Euproctis chrysorrhoea*, L., for which the usual remedies are recommended. Among the injurious sawflies noted are :—*Pteronus ribesii*, Scop., on gooseberry bushes ; *Selandria adumbrata*, Klug, on the leaves of cherry, pear and apple trees ; and *S. fulvicornis*, Klug, on plums.

SACHAROV (N.). **« Козявка »** (*Galerucella tenella*, L.) **какъ вредитель клубники и другіе виды изъ группы** Galerucini, **встрѣчающіеся въ Астраханской губ.** [*Galerucella tenella*, L., as a pest of garden-strawberries, and other species of *Galerucini* found in the Govt. of Astrachan.]—*Published by the Entom. Sta. of the Astrachan Society of Fruit-Growers, Market-Gardeners and Agriculturists, Astrachan*, 1913, 6 pp.

There are several species of *Galerucella* found in the Government of Astrachan, such as *Xanthomelaena*, Schr., which injures elm trees ; *G. viburini*, Payk., attacking *Viburnum opulus*, and *G. lineola*, F., a pest of willows. *Galerucella tenella*, L., found by the author on strawberries, has not been previously recorded as injurious to these plants. The beetle winters underneath old leaves on the beds of strawberries ; with the arrival of warm weather the insects appear and feed on the young leaves, and oviposit during April and May ; the eggs are deposited by the female in a hole gnawed by it in the leaf, 3–10 eggs being laid in such a hole ; the egg stage lasts 12–14 days. The author describes the egg, larva, pupa and imago, as well as the damage done.

The remedies suggested are : the destruction of weeds on the beds and keeping the soil friable continuously during the whole summer ; but the most effective remedy is spraying with Paris green ($\frac{1}{2}$ lb. of green and 1 lb. of lime dissolved in about 32–33 gals. of water) ; the spraying must be done first in April, as soon as the young leaves appear, then again in May, when the ovaries are formed, and again, if necessary, after the removal of the berries. As the insects keep mostly on the lower side of the leaves, special attention must be paid to spraying from below.

**Russian Crop Pests.—Извѣстія Главнаго Управленія Землеустройства и Земледѣлія.** [*Weekly Gazette of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, no. 47, 7th Dec. 1913, p. 1210.

The past autumn was not favourable to the activity of various pests,

and they have not, therefore, caused much damage to sprouted winter-sown crops. *Euxoa segetum* was chief amongst the pests noticed, and it has been reported from nearly all the Governments outside the "chornoisiom" area, and also from the following "chornoisiom" Governments:—Orel, Riazan, Tambov, Voronezh, Kiev, Taurida, Ekaterinoslav, and the Province of Don. Winter-sown crops, especially the early ones, were, however, seriously injured by this pest in Kazan, Viatka, Olonetz, and the western parts of Perm, and in some localities it has even been found necessary to re-sow. Elaterid larvae have done some small damage in Kiev, Cherson, Charkov, Tchernigov, Poltava and Vitebsk. *Mayetiola* (*Cecidomyia*) *destructor* has been reported from Kursk, Orel, Tambov, Podolia, Kiev, Bessarabia, Cherson, Taurida, Ekaterinoslav and Poltava; while the presence of *Oscinis frit* has been noticed in Kursk and Charkov. In Tula and in the Vistula Governments the crops were damaged by larvae of *Melolontha.*

As to Asiatic Russia, *Euxoa segetum* and Elaterid larvae were reported from various parts of Tobolsk, Tomsk and Enisseisk, and in the steppe provinces of Akmolinsk, Semipalatinsk and Turgai, although the damage done by them was very small and limited to a few localities only. In Tobolsk, *Haltica* and *Phyllotreta* were found, while from Enisseisk and the province of Akmolinsk *M. destructor* was reported. Egg-clusters of locusts were deposited in large numbers in Tobolsk and Akmolinsk. All these pests have done, however, very little damage, and disappeared with the early rains.

SIJAZOV (M.). **Наиболѣе дешевый и сильнодѣйствующій инсектисидъ для уничтоженія саранчевыхъ насѣкомыхъ.** [The cheapest and most effective insecticide for the destruction of locust pests.] — **«Туркестанское Сельское Хозяйство»** [*"Agriculture of Turkestan,"*] *Tashkent*, no. 1, Jan. 1913, pp. 30-35.

The author points out the advantages of sodium arsenite as compared with the insecticide usually applied in Turkestan, viz., Paris green with lime. The former dissolves easily in water, giving a solution which does not choke the sprayer; it withstands the influence of even heavy rains, when mixed simply with milk of lime and not with molasses or treacle, sticking firmly to the plants, and not requiring repeated sprayings; and under equal conditions and in equal doses it proves twice as rapid in its effects as Paris green. He also states that whereas Paris green contains only 24·3 per cent. of metallic arsenic (not arsenic acid), sodium arsenite contains 45·2 per cent. The author further deals with the prices of this chemical and the duties on it in Russia, and gives a comparative table showing the amount and cost of both insecticides necessary for one dessiatin (2·7 acres) in Turkestan. From this it appears that when using sodium arsenite it is possible to obtain a saving of from 30 to 60 kopecks (7½d. to 1/3) per dessiatin; taking into consideration that in Turkestan the campaign against locusts is distributed over large areas—50,000–60,000 dessiatins (162,000 acres)—this would result in a saving of about 10,000 rubles (£2,000).

The author points out that sodium arsenite, like Paris green, may

burn the plants, and requires careful handling by the workmen engaged in the operations.

Poniatovsky (S.). **Къ вопросу о борьбѣ съ Марокской Кобылкой, въ Бухарѣ.** [On the question of the fight against *Stauronotus maroccanus*, Thb., in Bokhara.]—*Agriculture of Turkestan, Tashkent*, no. 2, Feb. 1913, pp. 109-114, 1 map.

The author first reports on the results of fighting locusts in the five districts of south-eastern Bokhara in 1912, where the campaign has covered nearly 200 square miles, and has cost about £22,000. He mentions that the method of applying movable iron screens has proved very cheap, and resulted in considerable saving ; only some 270 acres of crops have been destroyed by the pests (non-flying insects), and enormous masses of the latter have been destroyed. In the eastern part of the Khanate no large swarms of locusts have been noticed since the campaigns of 1910–1911, but they are beginning to appear again, and it is estimated that next spring it will be necessary to start operations against them over an area of about 10 square miles. The favourable results were considerably diminished by the appearance of migrating locusts from the neighbouring steppes of Afghanistan, and apart from the damage done to crops by these flying swarms, they have deposited eggs over an area of 33 square miles, and about £32,000 are asked for the campaign during the next season. The author further draws serious attention to the fact of the immigration into Bokhara of locusts from Afghanistan, into which country according to statements by natives, they migrate from India, so that international endeavours are necessary to check the injurious activities of these pests. The author points out how the fight against locusts in the province of Samarkand proved fruitless so long as no remedies were applied against them in Bokhara, and how the fighting of the insects in that country led to a diminution and even total disappearance of them in some localities of Russian Turkestan. This does not apply to two other species of locusts found in Turkestan, namely *Caloptenus italicus*, L., which has a local breeding place, and *Locusta migratoria*, L., which breeds in the delta of the Syr-Daria, as well as at that of the Amu-Daria, but rarely flies far from its breeding places. The author further urges upon the Government of Bokhara the absolute necessity of fighting the insects, the expenses not exceeding 0·1 per cent. of the budget of the Khanate, which itself depends on the harvest and on the land duties collected in kind ; he also points out the importance of the cotton cultivation of Bokhara and Turkestan to the Russian textile industry. A map is appended showing the distribution of locusts in Central Asia.

Sijazov (M.). **Къ Біологіи Марокской Кобылки.** [On the biology of *Stauronotus maroccanus*, Thb.]—*Agriculture of Turkestan, Tashkent*, no. 2, Feb. 1913, pp. 115-126, 9 figs., 2 pl.

In the first part of his paper the author deals with the early stages of *Stauronotus maroccanus*, of which he gives a detailed description. There are five moults, and the period occupied by these stages is 35–

42 days. The second part is devoted to a consideration of the movements of the swarms of larvae. After extensive investigations in the field, the author concludes that these movements are not influenced by such factors as wind, sun, etc.; nor do they take place in any definite directions, being merely the fortuitous result of the gregarious instinct combined with the search for food. Cultivated crops appear to exercise no special attraction for these insects, and if the wild plants on the steppes afford sufficient food, the locusts will remain there during their whole period of development. On the other hand, the migratory movements of the flying locusts are more definite, the swarms always entering Russian Turkestan from the south, originating in Afghanistan.

Smirnov (D.). **Польза, приносимая Трясогусками въ Туркестанѣ.** [The utility of the Wagtail (*Motacilla*) in Turkestan.]—*Agriculture of Turkestan, Tashkent,* no. 3, March 1913, pp. 149-251.

The author draws the attention of farmers to the value of these birds in destroying the common pest of lucerne in Turkestan, *Hypera variabilis*, Hbst. These weevils start ovipositing in the Merv oasis on young leaves of lucerne as early as February; in 1912 the author found larvae on the 1st March. Oviposition proceeds till April, and the larvae do considerable damage, estimated at 50 rubles (about £5 5s.) per dessiatin (2·7 acres); the damage is the more felt as at this time there are no supplies of lucerne from the previous year, and food for cattle is very dear. The larvae appear in greatest numbers in March, there being only one generation in the year. In March the wagtails appeared, and the author observed both *Motacilla alba*, L., and *M. feldegii*, Mich.; the former species is not a resident, and soon disappeared. The author has found in the stomach of 5 birds, which were able to feed only half a day, 152 larvae of *Hypera* and 2 beetles; he estimates that the whole flock of birds on the spot under observation numbered a hundred, and that these would have destroyed as many as 6,000 larvae in one day. The importance of these birds is the greater, as the pest has no other natural enemies in Turkestan; the author obtained only two specimens of the parasite *Canidia curculionis* out of a thousand larvae. He considers that all the birds of this genus are useful to farmers, as their life-habits are very similar.

Portchinsky (I. A.). **Насѣкомыя, вредящія хлѣбному зерну въ амбарахъ и складахъ.** [Insects injurious to grain in stores and warehouses.]—**Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *St. Petersburg,* x, no. 5, 1913, pp. 84, 5 tables, 3 figs.

The author prefaces his book by some introductory general remarks as to insects injurious to grain in Russia, where these pests have sometimes destroyed more than half of the stored harvest in some localities. which, especially in the eighties of last century, seriously injured the export of Russian grain; he describes, generally, the nature of the

damage and its influence on the quality of grain and on human beings consuming bread prepared from such flour. He also deals with some of the generally applied remedies, mentioning first salt, the use of which was recommended even in the eighteenth century. Another old remedy is birch-tar, and the author has satisfied himself by experiments conducted some 8 years ago, that this substance does not in any way interfere with the quality of bread obtained from grain subjected to its influence, no smell or flavour remaining. Some experiments by A. I. Dobrodeev have shown that *Calandra granaria* although remaining alive for some considerable time when exposed to the emanations from tar, are unable to feed or copulate, and mostly remain lying motionless on their backs ; *Anobium paniceum* is better able to withstand its influence.

A still better remedy than tar is naphthalene, the use of which has also been recommended by the author since 1905, and this is now considered in Australia to be the principal preventive remedy. When used in small doses (small bags containing about $\frac{1}{2}$ lb. of naphthalene each, put on the surface of the flour) and especially when applied to grain, it keeps away the insects and leaves no disagreeable taste in the bread prepared from such grain or flour. The author describes some experiments conducted on *Sitotroga cerealella*, *Anobium paniceum* and *Calandra granaria* with naphthalene, which show that all these insects ultimately perish after being subjected to its emanations for a more or less considerable period, remaining most of the time in a state of collapse. The methods of applying carbon bisulphide and hydrocyanic acid are also fully described.

A description is given of the following beetles and their various stages, together with an account of their habits and the damage done by them :—*Calandra granaria*, L., *C. oryzae*, L., *Anobium paniceum*, L., *Ptinus fur*, L., *Tenebrio molitor*, L., *Tribolium confusum*, Duv,, *Gnathocerus cornutus*, F., and *Silvanus surinamensis*, L. In addition to the usual remedial measures, mention is made of the use of sheep skins, which are spread in the evening on the stored grain ; the insects settle on them and become entangled in the wool, so that they can be destroyed in the morning.

Besides the above insects, there were frequently sent to the Bureau samples of damaged flour containing other species which evidently did not cause serious injury to the flour, such as *Enicmus minutus*, L., *Lathridius bergrothi*, Reit., etc. There were also found very frequently, and sometimes in large numbers, the imagos and larvae of *Laemophloeus testaceus*, F., which some authors (Curtis) regard as injurious to grain, while others (Perris) consider it to be a rapacious insect. *Tenebroides mauritanicus*, L., is both injurious to grain and useful in destroying some other insects there ; it damages much more than is necessary for its food by devouring the embryo of the grain.

Amongst the moths, *Sitotroga cerealella*, Oliv., is specially injurious in many parts of Caucasia and Transcaucasia ; in the western parts of the government of Kutais, in some years it has destroyed the whole harvest of maize ; besides which it attacks also wheat, rye, and barley. The author describes the life-habits of this pest as recorded by

Haberlandt, Kollar and others. Some experiments conducted in the Bureau of Entomology by G. V. Zelenko have proved that in order to destroy all the stages of this pest completely at the usual room temperature, 14–16° R (64°–68° F.), in an isolated space, it is necessary to apply not less than 7 lb. of carbon bisulphide for every 1,000 cubic feet during 48 hours; should it be required to get the same results in 24 hours, 10½lb. of liquid are necessary. The samples freed from the pests must be kept in closed spaces and be protected by naphthalene or tar.

*Tinea granella*, L., is commonly found in Russia in grain warehouses, but the damage done by it is not so great as that done by *Calandra granaria*. As remedies are mentioned the removal of the matted grain by means of rakes, which must be done before the autumn, *i.e.*, before the larvae pass away from the grain to pupate, and the lowering of the temperature of the store by means of ventilation holes, etc. *Trachea* (*Hadena*) *basilinea*, Schiff., is very frequently found in Russia in ricks of unthrashed grain, and in stores, and often does great damage. These insects have only one generation during the year, the moths flying in summer, when the grain is developing in the ears, but the caterpillars are found during the whole spring, summer and autumn in different stages. The author describes the habits of the larvae and the damage done by them; during the harvest time most of the caterpillars fall from the ears to the earth, but in the evenings they get back to the sheaves remaining in the fields, and in this way they get into the ricks and barns. During the autumn their activity depends on the temperature, and in warm autumns they do considerable damage. Kiln-drying kills only the caterpillars near the floor of the kiln; by thrashing with chains only some of the larvae are destroyed, while thrashing with machines gives better results; winnowing does not separate them from the grain. Those larvae which remain in the fields feed on fallen grain or on grass, and pass the winter inside the stubble left in the fields. The author recommends that the sheaves should not be stacked in the same field in which they have been cut; should this be impracticable, the sheaves ought to be piled on a clean spot, surrounded by a trench, the latter being also quite clean from straw. The ricks ought to be loose, so as to allow of the ventilation of the pile and the access of fresh cold air, which will make the caterpillars harmless in the ricks till the arrival of warm weather. The caterpillars remaining in the fields can be best destroyed by allowing them to creep during the day underneath straw, spread in the field, which is afterwards burned. In the same way the stubble also must be burned, to facilitate which high-mowing is recommended.

The third group of pests are mites of the family, TYROGLYPHIDAE, the most common representative of which in stored grain and flour is *Tyroglyphus farinae*, Koch; *T. siro*, L. and *T. longior*, Gervais, being found mostly in cheese and less frequently in grain and flour. The author describes the life-habits of this species. According to the experiments of Zelenko on some representatives of the genus *Cheyletus*, living in dry hay and in stored clover seeds, 10½ lb. of carbon bisulphide for a space of 1,000 cubic feet are necessary to destroy the mites within 24 hours.

SACHAROV (N.). **Медвѣдка и мѣры борьбы съ нею.** [*Gryllotalpa vulgaris* and remedies against it.]—*Poster issued by the Entom. Sta. of the Astrachan Soc. of Horticulture and Agriculture, Astrachan,* 28th March 1913.

This poster gives general information as to *Gryllotalpa*, accompanied by figures of the imago, larva, eggs and damaged cabbage root and seeds, and suggests as the only effective remedy to use baits of maize poisoned with arsenic. In order to prepare these baits a mixture of about 3 lb. of arsenic, 6 lb. of lime, and about 36 lb. of maize is boiled together till the grains of maize are quite soft, adding water as it evaporates. The grains of maize ought not to be broken, as the insects may miss them in the earth. Having prepared the baits, the maize is spread on mats to cool, after which it is sown on the infected spot, ½ lb. of maize being used for every 10 cubic sajens [490 cubic feet]. The sowing must be finished 5–7 days before cabbage is sown on the spot; early in spring, when there is no other food, the insects will devour the poisoned baits and perish. In autumn another remedy is recommended, the object of which is to catch the wintering insects; for this purpose holes must be dug about 2–3 feet long, deep and wide, which are filled with well-rotted dung, and covered with earth; the insects enter these holes to hibernate, and at the first frosts they can be turned out and destroyed.

VITKOVSKY (N.). **Краткій обзоръ главнѣйшихъ вредителей и болѣзней културныхъ и дикорастущихъ растеній въ теченіе 1912 г. въ Бессарабской губ.** [Brief review of the chief pests and diseases of cultivated and wild plants noticed during 1912 in the Govt. of Bessarabia.]—Reprint from **« Труды Бессар. Общ. Естеств. и любит. естествозн. »** [*Studies from the Bessarabian Society of Naturalists and Friends of Nature-study,*] *Kishinev,* iv, 1913, pp. 17.

In an introduction to this review the author points out that the meteorological conditions in 1912 were specially favourable for various pests and diseases of plants. The following insect pests are mentioned in his list. Insect pests of orchards. LEPIDOPTERA: *Cydia* (*Carpocapsa*) *pomonella*, a real scourge throughout the Government; *Cydia funebrana*, Tr., and *C. putaminana*, Stgr., appeared everywhere, attacking plums and walnuts late in the season, but were controlled by some unknown factor; *Aporia crataegi*, L., specially abundant in the "Bessarabian Bukovina," where the butterflies covered trees and earth "like snow"; the peasants there regard it as a sin to collect and destroy the nests of these pests; *Euproctis chrysorrhoea*, L., this and the preceding species were destroyed in their nests by *Parus major*; *Lymantria dispar*, L., *Malacosoma neustria*, L., *Hyponomeuta malinellus*, Z., *H. variabilis*, Z., *Zeuzera aesculi*, L., and *Cnethocampa processionea*, L. COLEOPTERA: *Sciaphilus squalidus*, Gyl., appeared early in spring in enormous quantities; *Rhynchites bacchus*, L., *R. aequatus*, L., *R. pauxillus*, Germ., *R. betuleti*, F., *R. betulae*, L.; *Anthonomus pomorum*, L., yearly destroys the whole harvest in one apple orchard of about 108 acres; *Epicometis hirtella*, L., and *Lethrus apterus*, Laxm. TENTHREDINIDAE: *Hoplocampa brevis*, Klug, *H. fulvicornis*, Klug, *H. testudinea*, Klug. RHYNCHOTA: *Lecanium* sp.

(*?rotundum*, Réaum.), found in enormous quantities on plum trees in the "Bessarabian Bukovina"; these pests favour the growth of a fungus disease, *Capnodium salicinum*, Mont., and have led to a marked decrease in fruit-growing in the district; *Lecanium mali*, Schr., chiefly on apple trees; *Aspidiotus ostreaeformis*, Curtis, on pears, less frequently on plums, and only occasionally on apples; *Mytilaspis pomorum*, Bouché, on pears and apples; *Psylla pyri*, L., did serious damage to pears; APHIDIDAE were very abundant during the year, injuring apples, plums and peaches; they were preyed on by numerous *Coccinella septempunctata*, L.; *Tingus pyri*, F., found only once; *Phytoptus pyri*, Pagenst.

Insect pests of vine. *Phylloxera vastatrix*, Pl., found everywhere on old vine stems; *Melolontha melolontha*, L., in some vineyards more than 100 larvae were found underneath one vine; larvae of ELATERIDAE damaged young branches of vine; *Eumolpus vitis*, F., *Phytoptus vitis*.

Insect pests of field crops. *Oscinis frit*, L., v. *pusilla*, Mg., is the most widespread pest in the Government; *Mayetiola* (*Cecidomyia*) *destructor*, Say.; *Chlorops taeniopus*, Mg.; *Anisoplia austriaca*, Hbst.; *Melolontha melolontha*, L.; *Lema melanopus*, L.; *Jassus sexnotatus*, Fall.; various aphides and thrips.

Maize was injured by larvae of *M. melolontha*, L., *Pentodon idiota*, Hbst., ELATERIDAE, and *Pyrausta nubilalis*, Hb.; the spread of the latter pest is favoured by the neglect of the peasants to burn or destroy the maize stubbles, which they keep as food for cattle during the winter and spring, thus enabling the wintering pests to complete their development; the damage done by them is very serious. Winter rape was damaged by *Entomoscelis adonidis*, Pall., *Athalia spinarum*, F., and also occasionally by *Phlyctaenodes sticticalis*, L.; the latter also injured or destroyed melons, maize, vine and other plants. *Cleonus punctiventris*, Germ., was noticed in small numbers on beet; *Otiorrhynchus ligustici*, L., on lucerne; and *Apion apricans*, Hbst., on clover.

Insect pests of market garden crops. *Haltica oleracea*, *H. nemorum*, *Pieris brassicae*, *P. rapae*, *Mamestra brassicae* and *Aphis brassicae* are the usual pests, for which no remedies are applied in Bessarabia.

PACZOSKI (J. K.). **Обзоръ враговъ сельскаго хозяйства Херсонской Губерніи и Отчетъ по Естественно-Историческому Музею за 1912-1913 годъ.** [A Review of Pests of Agriculture in the Government of Cherson and the Report of the Natural History Museum for 1912-1913.]—**Естественно-Историческій Музей Херсонскаго Губ. Земства.**—[*Pubd. by the Nat. Hist. Museum of the Zemstvo of the Govt. of Cherson,*] *Cherson*, 1913, 34 pp.

*Anisoplia austrica*, Hbst., while totally absent in the northern parts of the Government, appeared in the south in numbers, suggesting that a serious outbreak of this insect may occur soon; this has not been the case for the last ten years. The larvae of *Athous niger*, L., damage wheat crops in some localities; while *Epicometis hirtella*, L., injured ears of oats. Two hemipterous insects were noticed on lucerne, which had not previously been observed on this plant, *Adelphocoris*

*lineolatus*, Goeze, and *Acocephalus rusticus*, F. The former species was noticed on two estates in the northern districts. According to I. V. Vassiliev the insect has two generations in South Russia. It winters in the egg stage, the eggs being laid in the lower part of the stem of the lucerne stubble; the young bugs issue at the end of the spring and start sucking the tender parts of the plants; in the first half of July they reach their mature stage, ovipositing again in the autumn. Insecticides are of no avail, and the only remedy recommended by Vassiliev consists in destroying the wintering eggs by slightly burning the lucerne stubble. To effect this, the field of lucerne is covered with a loose and even stratum of straw of a thickness of about 3½ inches, which is burned in suitable weather, viz., dry, with a slight wind; the flame should pass rapidly and evenly over the field.

Vassiliev reports favourable results obtained by this method in the Government of Ekaterinoslav, and points out that the slightly burned plants of lucerne gave good new shoots. As to *Acocephalus rusticus*, F., its life-habits are little known; it appeared usually in company with *Adelphocoris lineolatus*, so that the particular damage done by it could not be ascertained. *Macrosiphum pisi*, Kalt., was also found on lucerne, where, however, these lice do not multiply to a dangerous degree, they being chiefly pests of peas.

*Phlyctaenodes sticticalis*, L., appeared this year in many parts of the Government, injuring lucerne, maize, sunflower and potatoes; they did not touch *Sisymbrium losselii*, L., but were found frequently on *S. sophia*, L., also on *Artemisia*. *Lethrus cephalotes*, Laxm., did some damage to linseed crops in the district of Cherson.

*Epicometis hirtella*, L., was found this season in lesser numbers than in previous years and has done damage only in some localities. In the environs of Cherson it attained its greatest numbers at the time of blossoming of the cherry trees, which suffered most from its attacks. The author experimentally tested the remedy recommended by J. F. Schreiner, namely, trapping the beetles on sheets of blue paper covered with an adhesive. He concludes that the method is of no practical value, as the insects did not show any preference for the blue sheets. It was noticed that the insects did not pay any attention to the blue flowers of *Chorispora tenella*, D.C., which grew underneath the cherry trees, or to other blue flowers, concentrating only on the blossoms of cherries. The same negative results from adhesive blue sheets were also reported from Turkestan with *Oxythyrea cinctella*, and from Kishinev.

The following insects injurious to orchards have been noticed. *Hyponomeuta malinellus*, Z., *Euproctis chrysorrhoea*, L., *Malacosoma neustria*, L., *Cydia* (*Carpocapsa*) *pomonella*, L., *Acronycta tridens*, Schiff., *Coleophora hemerobiella*, Sc., *Phalera bucephala*, L., *Hylotoma rosarum*, F., *Tingis pyri*, F., and *Aphis ribis*, L.

For the first time during his sixteen years' experience the author met with *Pyslla pyricola*, Först., and it raises the question whether the pest has only this year invaded the Government, or whether it has existed there previously without being able to develop to a noticeable degree, owing to some unfavourable conditions; as a remedy, dusting with tobacco is suggested. *Eumolpus vitis*, F., was also

noticed on vine for the first time in the Government, though known previously in Bessarabia. *Phytoptus pyri*, Sor., has done substantial damage in some localities, and occurred in considerable numbers. The following forest pests are reported. On oaks, two species of the genus *Haltica* appeared in some localities, the most serious damage being done to single trees and small scattered groups of trees on pasture land; oaks in enclosures, where no grazing took place, suffered less, or not at all. Leaves of elm trees were injured by *Galeruca xanthomelaena*, Schr. *Claudius viminalis*, Fall., were found on poplars in Cherson, there being evidently two generations of the pest in the Government.

Larvae of *Cimbex amerinae*, L., or a similar species, were noticed on *Salix acutifolia*, W., on the sands in the valley of the river Dnieper; the leaves were sometimes totally devoured, only the veins remaining. *Lecanium robinarium*, Dougl., is increasing in the Government; in the year under report they were found on *Corylus avellana*, and on maples in some localities.

WEBSTER (F. M.) & PARKS (T. H.). **The Serpentine Leaf-Miner.**—*Jl. Agric. Research, Washington*, i, no. 1, Oct. 1913, pp. 59–87, 17 figs., 1 pl.

The serpentine leaf-miner is the larva of *Agromyza pusilla*, Mg., a minute yellow and black fly, which is common in alfalfa fields during the summer; it has a wide range of food-plants, and is generally distributed over the United States. Outside the United States the species has been found in central and northern Europe, Italy, Sicily, and Egypt.

The larvae injure the foliage of the plant by devouring the parenchyma of the leaf; leaves of white clover and of young alfalfa often having the entire cellular tissue devoured, leaving only the two membranes. Usually only one larva is present in each leaf. The injury is greatest in the south-western States, where the discoloured leaves are sometimes present in sufficient numbers to lower materially the quality of the hay. The injured leaves can be found in the fields from May until November, the larvae continuing to feed until the frosts; in Florida the larvae feed throughout the winter, but usually the insect hibernates in the puparia beneath the surface of the soil at the base of the plants. There are five or six generations in lat. 41°, the number varying with the length of the growing season. The generations overlap to such an extent that all stages can be found in the fields during most of the season. During the period of highest temperature in summer, the larvae are usually found infesting plants protected from the direct rays of the sun; in the south-west the insect almost completely disappears from the fields at this time, reappearing in September.

The eggs are deposited in the leaf tissue, and are inserted in punctures identical with those made by the adult in feeding; the eggs take 4 days to hatch in June, the larval period being then 4 days. In the eastern States pupation occurs entirely in the soil; in the more

arid western States it takes place usually in the larval chambers in the leaf; the pupal period in June is 10 days. The average period of the complete life-cycle is 23 days.

Besides alfalfa, clover, cowpeas, rape and cotton are subject to attack. A few nearly-related and very similar leaf-miners are known to attack timothy, wheat, oats and grasses; when these crops are affected, the mine usually extends the entire width of the leaf, and may kill the plant if it is very young.

Numerous parasitic insects attack and consume the larvae and pupae within their mines; these are highly efficient and keep the insect under control. The following is a list of these parasites:— *Diaulinus begini*, Ashm., *D. websteri*, Cwfd., *Chrysocharis ainsliei*, Cwfd., *C. parksi*, Cwfd., *Derostenus arizonensis*, Cwfd., *D. diastatae*, How., *D. punctiventris*, Cwfd., *D. pictipes*, Cwfd., *D. varipes*, Cwfd,. *Diaulinopsis callichroma*, Cwfd., *Cirrospilus flavoviridis*, Cwfd., *Zagrammosoma multilineata*, Ashm., *Closterocerus utahensis*, Cwfd., *Pleurotropis rugosithorax*, Cwfd., *Eucoila hunteri*, Cwfd., *Sympiesis* sp., *Pteromalus* sp., *Cirrospilus* sp., *Diaulinopsis* sp., and a species of ENTEDONINAE. Braconid parasites include *Opius agromyzae*, Vier., *O. aridus*, Gahan, *O. brunneipes*, Gahan, and *O. suturalis*, Gahan. The following are predaceous upon the serpentine leaf-miner: *Triphleps* sp., and *Erythraeus* sp. Most of these parasites are functional in the control of more than one species of leaf-miner, and are very widely distributed.

Frequent cutting of alfalfa kills the larvae in the leaves, and does much to protect this crop; this method should be followed where the injury becomes serious. Deep autumn or winter ploughing is advocated for annual forage crops and cereals, in order to bury deeply the hibernating puparia located near the surface of the ground.

DE CHARMOY (D. d'E.). **Summary of investigations on Insect Pests during the three months, May-July, 1913.**—*Mauritius Dept. of Agric., Div. Entom.*, 27th July 1913, 2 pp.

The sugar-cane leaf aphis (*Aphis sacchari*). By the middle of June fields severely infested by these plant-lice were noticed on two plantations. As predaceous insects, such as SYRPHIDAE and COCCINELLIDAE were found at work, no remedy was suggested. A fortnight later the pest was found to have been completely checked by a fungus disease, and the plants were rapidly recovering.

In June the manager of the Bassin Estate found White Tannas diseased. These were uprooted, and the damage was found to be due to "moutoucs" (*Oryctes* and *Lachnosterna* larvae). The larvae were dug out, and with them a certain number of *Scolia rufa*, which were proved to be parasites of the *Oryctes* larvae.

*Chionaspis tegalensis*. Samples of sugar-cane received from Industry Estate, Long Mountain, were found heavily infected with this scale-insect, and about five acres of another plantation were entirely covered with this pest. Early cropping and burning of the canes before cutting have been suggested as a means of getting rid of the insect.

The sugar-cane white louse (*Pseudococcus calceolariae* var. *sacchari*). Young virgin canes were found suffering from this scale-insect, which was attacking the roots, this being due to infested cuttings not having

been disinfected. A fungus disease was keeping down the Coccid, the aggregated insects being reduced to a sort of pulp. For disinfecting the cuttings kerosine mixture has been suggested. For this mixture, to 25 grams of soap disolved in 500 c.c. boiling water, add 2 litres petroleum, gradually stirring the while; add to 600 c.c. of this emulsion, 400 c.c. of Phenyl, or 300 c.c. of Creolin. This mixture at a strength of 1 per cent. in water damages green leaves, and should only be employed for disinfecting the soil or against scale insects attacking the bark.

HARDENBERG (C. B.). **Peach-tree Aphides.**—*Agric. Jl. Union S. Africa, Pretoria,* vi, no. 2, Aug. 1913, pp. 224–235.

During the winter and early spring of 1912, the author made some observations and experiments regarding the life-history and control of the black and green peach aphids [*Aphis persicae*, Boyer, and *Rhopalosiphum dianthi*, Schr.] in the Pretoria and Johannesburg districts, where the two insects are generally very prevalent, and may cause a complete failure of the peach crop in some localities. The observations can be divided into such as relate to (*a*) life-history, including hibernation and dispersal; (*b*) parasitism; and (*c*) the use of tobacco extract as a means of control.

The following summary is given of the results of the experiments:—

(1) In sheltered situations the black peach aphis probably hibernates on the trees, and may breed through the winter; (2) though primarily infesting the young shoots and fruit-buds, the black aphis will also attack the leaves; (3) dispersal takes place most probably through the agency of winged individuals, which are produced as soon as a favourable mean temperature is reached; the distribution is too scattered to admit of its being effected by ants carrying the young aphides to other situations on the tree; (4) the presence of aphis at the base of the flower-bud causes it to swell and open prematurely, or at least in advance of others which are not attacked by aphides; (5) the green peach aphis breeds in the winter on cabbage, parsnips, and probably other cruciferous plants; (6) in the absence of definite data regarding the season history of the black aphis parasite, we may presume that the hibernating colonies keep this parasite breeding through the winter season; (7) the black peach aphis is attacked by one hymenopterous internal parasite and preyed upon by two species of Syrphid flies and three species of lady-birds; (8) the total length of the life-cycle of the Syrphid, *Xanthogramma scutellaris*, is about three weeks; egg stage, three to four days, larval stage about twelve days, and pupal stage five days; (9) the Syrphid pairs in late afternoon; eggs are deposited at intervals of about one minute; (10) tobacco extract in a solution containing about 0·082 per cent nicotin is the most effective strength; no advantage is gained by using a stronger solution; this kills the aphis within 24 hours, being equivalent to a dilution of "Eagle Brand" extract of 1:100, and of "Lion Brand" extract 1:80; (11) the tobacco wash is more effective in sunshine than in dull cloudy weather; (12) green peach aphis can be effectively kept under control by three thorough sprayings about five days apart, the first being applied as soon as the first leaves open out; the first appearance of the aphis should be watched for closely; (13) for effective spraying an underspray attachment is essential; the spray should

be applied along the branch from below (towards the tip of the branch or twig), as the force of the spray will momentarily open the curled-up leaves ; (14) the use of soap at the rate of 1 lb. in 25 gallons of spray is advisable ; (15) the cost of the application should not exceed 1*s*. 6*d*. per tree for the three sprayings together ; (16) by means of these three sprayings a good crop of peaches can be secured, even in heavily infested orchards ; (17) clean cultivation between the trees is advised ; cabbages, parsnips or cruciferous vegetables should not be grown during the winter in or near the part of the garden where peach trees are standing, as they furnish breeding places for the green peach aphis.

In a note by Mr. Lounsbury it is stated that the above report on spraying tests concerns the green peach aphis. The black species is commonly found during winter ; and when it has to be combated, it is is advisable to take advantage of the nakedness of the twigs, by making a thorough application of the spraying preparation shortly before the buds open. Should three sprayings, as recommended, not suffice for the control of the green species, as may be the case in seasons which particularly favour the pest, applications at intervals of about five days should be continued.

VAN DINE (D. L.). **Report of the Entomologist.**—*Expt. Sta. of the Sugar Producers' Assn. of Porto Rico, Rio Piedras, P.R., Bull.* no. 5, Aug. 1913, pp. 25–46.

In this report the author states that the May-beetles and their white grubs form the first line of his work, since the control of these insects is the most acute problem before the planter. The following is a list of the insects affecting sugar-cane in Porto Rico, together with their natural enemies, and an indication of the injury they cause :—

(1) The moth stalk-borer (*Diatraea saccharalis*, F.) tunnels into the cane stalk ; kills young cane ; affects the germination of seed cane. Its enemies are an egg-parasite, *Trichogramma minutum*, Riley ; a Tachinid fly, *Tachinophyto* (*Hypostena*) sp. ; and a fungus, *Cordiceps barberi*, Giard ; (2) May-beetles and white grubs (*Lachnosterna* spp.) The adults feed upon the leaves, and the larvae upon the roots and the root-stalks externally ; their enemies are : a wasp, *Elis sexcinta*, F. ; the Tachinid flies, *Cryptomeigenia aurifacies* and *Eutrixoides jonesii* ; an Elaterid beetle, *Pyrophorus luminosus*, Ill. ; a fungus, *Metarrhizium anisopliae*, Metsch. ; " blackbirds " (*Crotophaga ani* and *Holoquiscalus brachypterus*); (3) the weevil root-borer (*Diaprepes spengleri*, L.), whose larvae feed within the root-stalk and prune the roots to some extent ; the blackbirds, noted under *Lachnosterna*, feed upon its larvae at ploughing time ; (4) Rhinoceros beetles (undetermined Dynastids). Their larvae feed upon the roots, and within the root-stalk ; the fungus, *Metarrhizium anisopliae*, and the blackbirds, both noted under *Lachnosterna*, are natural enemies ; (5) The Mealy-bug (*Pseudococcus sacchari*, Ckll.), feeds on the underground portions of young cane, at the base of the leaves, and beneath leaf-sheaths of older cane ; the introduced ladybird beetle, *Cryptolaemus montrouzieri*, Muls., and the parasitic fungi, *Aspergillus* sp. and *Isaria* sp., are natural enemies ; (6) the mole-cricket (*Scapteriscus didactylus*, Latr.), eats into seed cane and the young shoots beneath the surface of the ground ; natural enemies are the blackbirds and lizards ; (7) the southern grass-worm

(*Laphygma frugiperda*, S. and A.), the larvae of which eat leaves of young cane. A Braconid, *Chelonus insularis*, Cress. (?); the Tachinid flies, *Frontina archippivora*, Will., *Gonia crassicornis*, F., and *Archytas piliventris*, Wulp; a Carabid beetle, *Calosoma alternans*, F.; the fungi, *Botrytes* sp. and *Empusa* sp., and the blackbirds are natural enemies; (8) the grass-looper (*Remigia repanda*, F.), the larva of which eats leaves of young cane, the natural enemies being Tachinid flies and a Carabid beetle, *Calosoma alternans*, F.; (9) the West Indian sugar-cane leaf-hopper (*Delphax saccharivora*) feeds on leaves and stalks of young cane; its natural enemies are: a Mymarid, a Dryinid and a *Stylops;* (10) the sugar-cane Aphid (*Sipha graminis*, Klt.) feeds on the leaves; its enemies are: a Syrphid fly, *Ocyptamus* sp.; ladybird beetles, *Cycloneda sanguinea*, L., *Megilla innotata*, Muls., *Scymnus loewii*, Muls., *S. roseicollis*, Muls.; a lace-wing fly; a fungus, *Acrostalagmus* sp.; (11) the hard-back or black night-beetle (*Ligyrus tumulosus*, Burm.), the larva of which is found at the roots, and is attacked by a wasp, *Campsomeris dorsata*, F.; (12) the weevil stalk-borer (*Metamasius hemipterus*, L.), follows disease or other injury, infesting both stalks of growing cane and seed cane; no enemies have been observed; (13) the shot-hole stalk-borer (*Xyleborus* sp.) follows disease, usually the rind disease (*Melanconium sacchari*), in the stalks and seed cane; no enemies have been observed; (14) the grass-worm (*Cirphis latiuscula*, H. S.), eats young leaves; a Braconid (undetermined) and the blackbirds are natural enemies; (15) a Skipper (*Prenes nero*, F.), whose larva eats young leaves; it is parasitised by a Braconid; (16) the scale-insect, *Targionia sacchari*, Ckll., parasitised by a Chalcidid; (17) the green Diabrotica (*Diabrotica graminea*, Baly), the adults of which feed on the leaves to a slight extent; the habits of the larva are not known; no enemies have been observed; (18) a termite (*Eutermes morio*, Lath.), attacks the seed and does not appear to have any enemy; (19) an undetermined Tineid, attacks the base of young shoots and eyes; no enemy has been observed; (20) mites have been observed to feed upon the stalks beneath the leaf-sheath and upon the leaves; no natural enemies observed.

An extensive bibliography of 41 works, containing papers on Porto Rico sugar-cane insects follows. From this list the author gives a general summary, referring to the injurious species according to the part of the plant they affect.

It was in 1910 that the larvae of the so-called Rhinoceros beetles were discovered, and in 1911 about 15 acres of cane were found infested to a serious extent by them. Thus far the insect has been observed breeding at the roots of cane only on the south coast of the island; it is also found in old wood in the forest. The grubs are eaten by the blackbirds at ploughing time, and the local form of the parasitic fungus, *Metarrhizium anisopliae*, also attacks them. The plantation practice of planting cane by opening up new furrows between the old rows without first ploughing out the old stubble, greatly favours the development of the grub of the Rhinoceros beetle, and of the white grub of the May-beetle. The old stubble should be thrown out, as then the blackbirds are able to feed upon the grubs, and the latter may also be picked up and destroyed. It seems probable that this Rhinoceros beetle is a species recorded under the name of *Strategus titanus* from the islands of St. Croix and Jamaica, as a pest of the

sugar-cane, and which is also recorded from Porto Rico by Stahl. The weevil root-borer (*Diaprepes spengleri*, L.), which in the larval stage attacks the roots of sugar-cane, must now be added to the list of borers affecting the plant in Porto Rico. The adult weevil has already been recorded as an enemy of citrus trees, and as common in coffee plantations, and was stated to have other hosts, as the guava, avocado, mango and rose. The author has observed the adult weevil feeding on the leaves of the sugar cane and on those of the "jobo," *Spondias lutea*. The blackbirds feed upon the weevil root-borer at ploughing time. Generally, the measures of control would be collecting the grubs and adults.

SCHWARTZ. **Nikotin als Insektengift.** [Nicotin as an Insect Poison.]—*Mitt. k. biol. Anst. für Land- und Forstwirtschaft, Berlin*, viii, 14th Sept. 1913, pp. 36-37.

Laboratory experiments were made to find the effect of nicotin and its salts upon insects. Besides pure nicotin the following salts of it were used :—lactate, acetate, trichloracetate and nitrate. All these substances, in 0·015% solution, acted as a skin poison upon Aphids (*Rhopalosiphum ribis*). Solutions containing 0·025% of the substance killed 93–98% of the Aphids. As an internal poison, 0·05% solutions were effective for caterpillars of *Vanessa polychloros*, *V. io*, and *Orgyia antiqua* ; 0·2% solutions for caterpillars of *Lymantria dispar* and *Stilpnotia salicis* ; and 1% solutions for *Malacosoma neustria*. Poisoned food affected only the caterpillars of *Vanessa io* and *polychloros*. In the cases where the caterpillars of these species ate leaves sprayed with nicotin compounds, they pupated imperfectly, and in no cases were butterflies produced from them. The spray solution used was 0·05% in strength. The difference in action of the several compounds of nicotin used was not worked out.

The following Series of Abstracts is taken from **«Садъ, Огородъ и Бахча*»** [**Orchard, Market Garden & Bachza.**]—*The Journal of the Astrachan Society of Fruit-Growers, Market-Gardeners & Agriculturists, Astrachan.*

SACHAROV (N.). *Opatrum sabulosum*, L., **какъ вредитель бахчевыхъ растенiй въ Астраханской г. и подсолнуховъ въ Саратовской.** [*Opatrum sabulosum*, L., as a pest of cucurbitaceous plants in the Govt. of Astrachan and of sunflower seeds in the Govt. of Saratov.]—*Orchard, Market-Garden & Bachza*, 1913, Reprint, 2 pp.

The larvae of this Tenebrionid beetle in their life-history, and in the character of the damage done by them, resemble the larvae of *Agriotes lineatus*, L. The author points out, therefore, that not all the injury

*[The Tartar word **Бахча** (Bachza) is used in South and South Eastern Russia of fields set apart for the cultivation of various species of melon, chiefly water melons, the yield varying from 110 to 300 melons per acre. These fields are only used for this purpose for one year, after which they are given up to ordinary crops. In some parts of the chornoiziom area cucumbers and other vegetables are grown on these fields.—Ed.]

attributed to the latter pests is really done by them. He obtained this year, some larvae from the Zemstvo of Saratov, which have damaged sunflowers, and from them he reared some *O. sabulosum*, the remaining larvae producing *A. lineatus*, and another unidentified beetle. In the same way he obtained an imago of *O. sabulosum* from some larvae which were damaging lemons in the Government of Astrachan.

These insects live during the whole summer, often hiding underneath stones or dry cattle-dung; they are found in large numbers in both the above Governments, and in the opinion of the author, about 90 per cent. of the damage to "bachza" plants in Astrachan, usually attributed to the larvae of *A. lineatus*, is really done by the former pest when the larvae of *Euxoa segetum* are absent.

The author describes the larva, pupa and imago of the *Opatrum*. As to remedies, further investigations will, he says, be necessary.

VOSTRIKOV (P.). **Коротѣды** [Bark Beetles.]—*Orchard, Market-Garden and Bachza*, Feb. 1913, pp. 40-41.

The habits of *Eccoptogaster rugulosus*, Ratz., and *E. mali*, Bechst., are very similar, and both injure mostly cherry trees and plum trees, but also apple, pear, apricot, etc. There are two generations; the first occurring from the first half of May till the end of July, the second from July till the end of summer. The control of the insects is not an easy matter, the part played by parasites being minimal, and insecticides being of little avail. As preventive remedies, the author recommends smearing over the trunks of trees early in spring, before the opening of the buds, with 3 per cent. solution of iron-sulphate, or with a mixture of milk of lime with iron sulphate (1 lb. of the latter in about 2·7 gallons of water). As to destructive remedies, the cutting in spring of those branches which have no leaves, the cutting out of the larvae from the trunks in May and June, smearing over the wounds with lime and clay, or with garden tar, are recommended. It is also useful to plug the openings on the bark and any wounds with a mixture of one part of carbolineum with two parts of lime. *Sorbus* and *Crataegus* ought to be excluded from gardens or used as bait trees, and burned afterwards. In the same way damaged trees ought also to be burned, as well as injured branches, etc.

RASTEGAJEV (P.). **Наилучшій способъ уничтоженія медвѣдки въ садахъ и огородахъ.** [The best method of destroying *Gryllotalpa* in orchards and in market-gardens.]—*Orchard, Market-Garden and Bachza*, Feb. 1913, pp. 41-42.

The author describes, generally, the damage done by these pests to orchards and market gardens, which in south-eastern Russia is enormous. He recommends a new remedy, which he considers superior to all those usually recommended, such as (1) bait-holes; (2) poisoning by maize; (3) destruction of the nests with eggs; (4) spraying of the soil with carbon bisulphide; (5) moistening of the beds with a mixture of water and carbon bisulphide; (6) addition of turpentine to the water used for watering the beds, etc. His remedy consists in pouring naphtha into the burrows of the insects. For this purpose

a jug containing water and naphtha, the latter keeping on the surface of the water, is used; having found a burrow, the naphtha is first poured in, either through a special tube attached to the lip of the jug, or by simply pouring it over the edge; then water is poured in so as to drive the naphtha into the hole; one half to 1 pint of water over some naphtha proves sufficient to drive out the insect, and it perishes soon afterwards. He reports that in this way a boy (whose daily wages were 25 copecks—about 6*d.*), has destroyed 300 insects in a day. The author has also invented a special jug, with two tubes, and two separate compartments for water and for naphtha.

SACHAROV (N.). **Гусеница бабочки** *Evergestis extimalis*, Sc., **какъ вредитель нѣкоторыхъ огородныхъ культуръ.** [The caterpillar of *Evergestis extimalis*, Sc., as a pest of some market-garden crops.]—*Orchard, Market-Garden and Bachza*, March 1913, pp. 160-161, 3 figs.

It has not been previously reported that the caterpillars of *Evergestis extimalis*, Sc., injure cruciferous plants, but during last summer they have been noticed damaging sprouts of radish and turnip in one experimental nursery in the Government. The author describes and figures the imago and the caterpillar, and figures also a damaged pericarp. The eggs are deposited on the pericarps and the caterpillars feed on the seeds. Pupation takes place on the same plants on which the caterpillars have fed, between the leaves or the branches of the stalks. It is assumed that there are two generations, the second one breeding on wild Cruciferae. Paris green may serve as an insecticide, as the insects feed also on the outer parts of the fruits.

SACHAROV (N.). *Oecanthus pellucens* Scop., **какъ временный сожитель виноградной лозы.** [*Oecanthus pellucens*, Scop., as a temporary parasite of vine-branches.]—*Orchard, Market-Garden and Bachza*, April 1913, pp. 193-196.

The tree cricket, *Oecanthus pellucens*, oviposits inside the summer branches of the vine, laying two, and sometimes three eggs in one hole; the larvae emerge from the egg in the following spring, the imago appearing in July. The author is of opinion that this insect is rather useful than injurious, as from the moment of its hatching out till late in the autumn, it destroys plant-lice wherever it can find them. As to the oviposition on vine, the insect only casually visits this plant, and the damaged branches do not suffer from the piercing, as the openings grow over again later. As it oviposits also on those parts of the summer branches which are cut off and burned before the winter, numbers are destroyed. In Astrachan the insect survives by depositing its eggs over the winter on *Rubus caesius*, L.

SACHAROV (N.). **Отъ Энтомологической станціи Астраханскаго Общества Садоводства, Огородничества и Плодоводства.** [Notes from the Entomological Station of the Astrachan Society of Horticulture and Agriculture.]—*Orchard, Market-Garden and Bachza*, April 1913, pp. 196-200.

The author calls attention to the appearance of a Chrysomelid

beetle, the larvae of which mine the leaves of garden strawberries. On some leaves as many as 270 eggs were found, and the larvae threatened to destroy the whole crop of strawberries. He suggests spraying the plants with Paris green, repeating the spraying later when the ovaries are well formed. The insecticide must be used in a proportion of 1 oz. of green and 2 oz. of lime dissolved in 7 gallons of water.

In some parts of the Government larvae of a Galerucid beetle, *Leptosonyx silphoides*, appeared, moving in large numbers over the steppes, after the manner of *Phlyctaenodes sticticalis* ; the author is, however, of opinion that this insect feeds only on wormwood, not touching cultivated plants.

Recipes are given for one insecticide and two fungicides. The insecticide is recommended against pests of the vine, and consists of a solution of $2\frac{1}{2}$ lb. sulphate of iron in $23\frac{1}{2}$ gals. water, with which the young buds are to be sprayed in early spring.

Sacharov (N.). **Азіатская саранча въ низовьяхъ Волги и борьба съ нею.** [Asiatic locusts in the lower parts of the Volga, and the fight against them.]—*Orchard, Market-Garden and Bachza*, July and Sept. 1913, pp. 436-440 & 559-563, 11 figs.

The southern parts of the Government of Astrachan, along the banks of the Volga and of the Caspian Sea are most suitable places for the breeding of Asiatic locusts (*Locusta migratoria* and *L. danica*) ; the coasts are covered with reeds, there being also various meadow plants, and the soil is suitable for the oviposition of these insects. The people in these parts are mostly fishermen, and, therefore, the damage done by the pests is usually disregarded, the locusts appearing every year without exception. Oviposition takes place at the end of August and during September on friable, sandy or loamy soil, and the hatching begins in May. The spring floods of the Volga destroy large numbers of eggs, and the author is of opinion that if this were not the case, the locusts would become so numerous as to threaten even many central Governments of Russia.

The following parasites of locusts are mentioned :—*Sarcophaga lineata*, Fall., which mostly parasitises the larvae, and another fly of the genus *Anthomyia*, which attacks the winged insects. Besides these flies, the following insects prey on the eggs of the locusts :—*Epicauta erythrocephala* v. *latelineolata*, *Mylabris calida*, and the larvae of flies of the genus *Systoechus* ; the latter being found by the author in 20–25 per cent. of the egg-clusters.

The difficulties in combating the insects are considerable, owing to the situation of the breeding places among flooded reeds, and the lack of workmen on the spot, etc. The method adopted was spraying with Paris green (1 lb. of green, 4 lb. of milk of lime, and 2 lb. of a special glue, in about 14 gallons of water) ; for the later larval stages the insecticide was made even stronger.

Rastegajev (P.). **Мои случайныя наблюденія за вредной дѣятельностью арбузнаго червя.** [My casual observations on the injurious activities of the Melon-Worm.]—*Orchard, Market Garden and Bachza*, Sept. 1913, pp. 565-568.

The name of " melon-worm " is applied to the larvae of *Euxoa segetum*, and the damage to melons was observed only in the first half

of June, when many of the young sprouts were destroyed. Hand-picking at night was adopted, and the remaining plants were saved, 500 caterpillars having been collected on a space of 2 acres. The author also suggests spraying with Paris green (about $1\frac{1}{2}$ oz. of green in about 2·7 gallons of water).

Ryshkov (N.). **Мышьяковистая известь и парижская зелень, какъ инсектисиды.** [Calcium arsenate and Paris green as insecticides.] —*Orchard, Market-Garden and Bachza,* Oct. 1913, pp. 643-644.

The author reports the results of spraying with the above-mentioned insecticides in various orchards. In one case calcic arsenate was used, prepared as follows:—1 lb. of arsenic with $1\frac{1}{2}$–2 lb. of soda, being boiled in about 2·7 gallons of water till the arsenic was quite dissolved, which took about an hour; after this some 5 lb. of lime was added and boiled for another half an hour; this solution was made up to 270 gallons with water. Although there were rains during the spraying, and this was not repeated, the results obtained were excellent; and, whereas, during the previous year, *C. pomonella* destroyed more than three-quarters of the harvest in this particular orchard, no specimens of the pest were noticed this year. In another orchard the spraying was done with Paris green dissolved in sal-ammoniac, the amount of the latter being just sufficient to dissolve the green, and 1 oz. of this mixture was dissolved in 19 gallons of water; while in a third orchard the insecticide used was Paris green with lime (about $\frac{1}{2}$ oz. in 2·7 gallons of water). The results obtained were favourable with regard to *Hyponomeuta malinellus*, the larvae of which perished after 3–4 days, keeping all the time on the ends of the branches; while the activity of *C. pomonella* was practically unaffected.

Long (H. C.). **The Large Larch Sawfly.**—*Gardeners' Chronicle, London,* liv, no. 1394, 13th Sept. 1913, pp. 184-185, 1 pl.

The Large Larch Sawfly, *Nematus erichsoni*, has caused much damage in Britain since 1904; up to that time it had not proved harmful, but in 1904 it was observed in injurious numbers in Cumberland, and in 1905 it was reported as having wrought great havoc, and again in 1906. Since that time larch woods have suffered much from this insect, which has now been scheduled as notifiable to the proper authorities. In 1908, in Keswick, 200 acres were attacked, and hundreds of the trees had died; on Skiddaw alone 30,000 trees had to be felled in 1912 on account of the pest. This sawfly has been recorded in Germany, Switzerland, Holland, Denmark, Sweden, Finland, the United States, and Canada.

The damage is done by the larvae, which feed voraciously on the foliage of the larch; trees of any age may be attacked. Repeated defoliation may kill the tree. When full-fed the larvae enter the moss or soil beneath the trees and spin strong brownish cocoons, in which they pass the winter, pupating in the spring. The flies emerge from May to July, during which time eggs are laid. Hewitt found that development was parthenogenetic.

The sawfly is subject to attack by a number of parasites, chiefly the Ichneumon, *Mesoleius aulicus*, which is responsible for the death of

large numbers of the insect, to the extent sometimes of 70 per cent. A fungus (*Cordiceps*) also infests the cocoons.

Since tall trees are attacked, remedial measures against the infestation are rendered more difficult. Means of combat include crushing the larvae when near enough to the ground ; poisoning by spraying with lead arsenate or Paris green ; and destroying the cocoons in the soil, under the trees, during the winter.

Long (H. C.). **The Cherry Fruit Fly.** *Gardeners' Chronicle, London,* liv, 18th Oct. 1913, p. 271, 1 pl.

The Cherry Fruit Fly (*Rhagoletis cerasi*, L.) has been known on the Continent for a long time ; but English cherries do not appear to have ever been attacked. Affected cherries are, however, constantly imported into England, and in consequence it is not impossible that the pest may at any time establish itself in this country. Theobald says that should it become noticeable in any plantation or garden, it would be wise to forego the crop by having the fruit destroyed to prevent damage another year, and the possible spread to other plantations.

The Cherry Fly may be combated by the collection and destruction of affected cherries ; giving poultry the opportunity of picking up fallen cherries and maggots, as well as pupae in the soil ; combined with surface cultivation in autumn and winter, to expose the pupae to birds and the rigours of the weather.

**Plant Bugs on** *Hevea brasiliensis.*—*Jl. Board Agric. of Br. Guiana, Demerara,* vii, no. 2, Oct. 1913, p. 74.

An increase of the Pentatomid Bug, *Empicoris variolosus*, is reported. These are difficult to detect, as during the day they hide in depressions of the bark, old tapping wounds, etc. It is supposed that they cause exudation of the latex from young green shoots by sucking them. The matter is under investigation.

Theobald (F. V.). **The British Species of the Genus** *Macrosiphum*, **Passerini. Pt. II.**—*Jl. Econ. Biol., London,* viii, no. 3, 29th Sept. 1913, pp. 113–154, 29 figs.

In the first part of this paper (Jl. Econ. Biol., viii, No. 2) [see this *Review*, Ser. A., i, p. 332], a list of fifty-five British species of the genus *Macrosiphum* was given, and of these twenty-five were described. The present part deals with the remaining species, and five more are added to the list, bringing the number up to sixty. Of these, twelve species are new.

Felt (E. P.). **Twenty-eighth Report of the State Entomologist, 1912.**—*Bull. N.Y. State Mus., Albany, N.Y.*, no. 165, 15th July, 1913, 264 pp., 79 figs., 14 pls.

The authorship of the above paper, of which an abstract was given on p. 527, Vol. i., Series A., was attributed in error to the Director of the Museum instead of to Dr. E. P. Felt.

The reference should read as above.

## NOTICES OF ENTOMOLOGICAL APPOINTMENTS, &c.

---

Mr. Nowell, the Assistant Superintendent of the Local Department of Agriculture, Barbados, who was principally engaged upon Mycological and Entomological work, has resigned, and has now been appointed as Mycologist to the Imperial Department of Agriculture, Barbados. Mr. J. Sydney Dash, B.Sc., has been appointed in his place, and is expected to take up his duties in February.

Mr. C. F. C. Beeson, Indian Forest Service, has been appointed Forest Zoologist to the Government of India on the resignation of Dr. A. D. Imms.

# NOTICES.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

# CONTENTS.

CONTENTS—*continued.*

VOL. II. Ser. A. Part 2.—pp. 57-128. FEBRUARY, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.

LONDON:

SOLD BY

DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.

THE EARL OF CROMER, G.C.B., O.M., G.C.M.G., *Chairman.*

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. AUSTEN, Entomological Department, British Museum (Natural History).
Dr. A. G. BAGSHAWE, Director, Tropical Diseases Bureau.
Sir J. ROSE BRADFORD, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., A.M.S.
Dr. S. F. HARMER, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.
The Hon. Sir JOHN MCCALL, M.D., Agent-General for Tasmania.
Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.
Sir JOHN MCFADYEAN, Principal, Royal Veterinary College, Camden Town.
Sir PATRICK MANSON, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. F. H. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir DAVID PRAIN, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. READ, C.M.G., Colonial Office.
The Honourable N. C. ROTHSCHILD.
Mr. HUGH SCOTT, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. SHIPLEY, F.R.S., Master of Christ's College, Cambridge.
Sir STEWART STOCKMAN, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. THEOBALD, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. J. A. C. TILLEY, Foreign Office.
Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

### General Secretary.

Mr. A. C. C. PARKINSON (Colonial Office).

### Director and Editor.

Mr. GUY A. K. MARSHALL.

### Assistant Editor.

Mr. W. NORTH.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

**Bodkin (G. E.). A New Insect Pest of Coconut Palms in British Guiana, *Castnia daedalus*, Cramer.**—*Jl. Board Agric. of Br. Guiana, Demerara*, vii, no. 2, Oct. 1913, pp. 87–90.

The author states that in a coconut palm, well advanced in growth, the presence of the larva of this moth is easily detected, the signs of attack consisting of deep, irregular, longitudinal scars or furrows, running up the trunk of the palm in continuous lines, often 3 to 4 feet in length. The larvae themselves live in the burrows, which they make between the trunk of the tree and the broad and thickened bases of the leaves. In cases of severe attack, the trunk of the palm immediately beneath the crown may become so weakened that a strong gust of wind will cause the head to snap off. Frequent cases of this are to be observed on the Demerara River. The financial loss occasioned by this pest is an exceedingly serious matter, especially as the adult insect is winged, and capable of sustained and powerful flight. Descriptions of the various stages of the insect follow, but as regards the life-history little is known at present, any close investigation being an exceedingly difficult matter. The moths themselves are entirely nocturnal, and may at times be seen on the wing at dusk. Drastic measures are necessary to prevent further damage in the case of a heavily infested palm. All the lower leaves have to be carefully removed by cutting them away at the base and securing the larva. In this way as many as 19 larvae and pupae of *Castnia daedalus* have been taken from a single palm. Palms in an infected district should be examined at regular intervals for the presence of this pest, and to this end, the lower and older branches should be regularly removed, and the tree kept generally clean. No natural enemies have been discovered so far, but *C. daedalus* does not appear to infest palms inhabited by the so-called "Kop-Kop" ants.

**Sugar-cane Pests in British Guiana.**—*Agric. News, Barbados*, 16th & 30th Aug. 1913, pp. 226 & 282.

The large moth borer (*Castnia licus*) was present on most estates in 1912, the grand total of insects captured in all three stages on seventeen estates being 1,018,901, as against 2,384,430 for 1911. This decrease is stated to be due to nine months' extreme drought, and to the excellent work of collecting in 1911. The conclusions regarding methods of control are:—(1) Long-continued drought affects the insect adversely; (2) the peristent and vigorous collecting of caterpillars and pupae in the stools of canes is the most efficient method of fighting this pest; (3) the collection of the moths is a very useful practice; (4) birds may be encouraged by means of perches in the cane-fields, and these are useful aids in the control of *Castnia*; (5) continued warfare must be kept up against this pest until it is reduced to very small numbers over a series of years; a decrease for one year should not be taken as a reason for ceasing control operations; (6) continued efforts on one estate, or on a group of estates may result in practically freeing them from *Castnia licus*, although in localities near by the pest may be abundant; in such cases, however, the numbers can be kept down only by persistent effort year after year. The most important sugar-cane pests in British Guiana are the small moth borers

(*Diatraea saccharalis* and *D. canella*), now more abundant than 25 years ago. The number of caterpillars and pupae collected by cutting out "dead hearts" was 15,285,960 in 1913, as compared with 13,632,655 in 1912. It is advised that collecting should be commenced at the earliest possible moment, in order to prevent, as far as possible, the complete development of the larvae of the first generation, thus largely eliminating the second and third. On five estates 281,181 eggs were collected. Attention is given to indirect aids to control, prominent among which are :—(1) The production of healthy vigorous growing canes, and (2) the use of resistant varieties. To ensure healthy plants, selection of the very best tops only is admissible, and all operations of drainage, tillage, weeding, and manuring must be given careful attention also. The Bourbon cane best fulfils the second condition in British Guiana. Further suggestions are (1) that the trash should not be burnt, and (2) that there should be less ratooning. Termites come next to the small moth borer in point of severity of attack. The weevil borer (*Metamasius hemipterus*) was present on all estates, but abundant on only a few. Other insects, the occurrence of which is mentioned, are : The coconut palm weevil (*Rhynchophorus palmarum* ; the hard-back beetles, *Dyscinetus bidentatus* and *Cyclocephala signata* ; the shot-borer (*Xyleborus* sp.) ; the sugar-cane Aspidiotus( *Aspidiotus sacchari*) ; the pink mealy-bug (*Pseudococcus calceolariae*). A leaf-hopper and a frog-hopper (*Tomaspis* sp.) were observed in very small numbers. The cane-stool moth, the dead cane moth (*Monodes agrotina*) and several leaf-eating caterpillars, such as *Remigia repanda*, *Laphygma frugiperda* and *Lycophotia infecta* are also recorded.

SOLANET (L. E.). **Déstruction simultanée du Négril et de la Cuscute des Luzernes.** [The simultaneous Destruction of *Colaspidema atra* and Lucerne dodder.]—*Montpellier*, n.d., 30 pp.

Experiments made during four consecutive years have shown that calcium cyanamide, reduced to the finest and lightest powder possible and applied annually at the rate of 90 lbs. per acre, is an efficacious remedy against both the beetle and the parasitic plant. It does not interfere in any way with the growth of the lucerne. In order to spread such a small quantity of cyanamide uniformly the author advises its admixture with other substances, and gives the following formula : Cyanamide, 1 part ; gypsum, 2 parts ; wood ashes, 1 part.

GOWDEY (C. C.). **Report by the Entomologist of the Uganda Protectorate.**—*Annual Report of the Dept. of Agric. for the year ended* 31*st March, Kampala,* 1913, pp. 29-39.

*Insects attacking Coffee.*—*Lecanium africanum*, Newst., was the most prevalent scale-insect during the year, attacking both vigorous and weak trees, the latter usually fatally. It is treated successfully with a solution of whale-oil soap at a strength of 1 lb. of soap to 5 gallons of water. Both *L. viride*, Green, and *L. africanum* are associated with a black fungus. *L. viride* restricts its attacks to the under surface of the leaves and to young shoots. This species has also proved susceptible to treatment with whale-oil soap. It is preyed on by the Coccinellid

beetle *Chilocorus discoideus*, Crotch, and parasitised by a Chalcid. *Stictococcus gowdeyi*, Newst., attacks the young shoots, and is rather difficult to kill without using insecticides at such strengths as to affect the foliage. A large percentage of *Pulvinaria psidii*, Mask., was parasitised. *Ceroplastes ceriferus*, And., in addition to coffee, attacks tea, *Anona muricata*, *Citrus* spp., *Ficus* spp., and *Antigonon*. The Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.) in Uganda breeds throughout the year, some kind of food being always available. It has been bred from *Anona muricata*, banana, coffee berries, guava, lemon, orange, pine-apple and papaya. Of the crickets, *Gryllus bimaculatus*, de G., and *Gryllotalpa africana*, P. de B., the latter is the more destructive, particularly so in nurseries with heavy shading. The Coffee Beetle (*Stephanoderes Coffeae*, Haged) is reported to be causing less loss to coffee-growers.

*Insects attacking Cacao.*—The scale-insects (*Stictococcus dimorphus*, Newst.) were parasitised to a greater extent this year by the Noctuid moth, *Eublemma costimacula*, Saalm. Experiments showed that a spray of 20 per cent. solution of borax was most effective. Plant lice (*Aphis* sp.) have only been observed to attack cacao from about one to two-and-a-half years old, grown under heavy shade of bananas. They attack the undersides of the young terminal leaves and form a cabbage-like mass. They are always associated with an ant. This aphis is preyed on by the Mantids, *Sphodromantis lineola*, Burm., and *Pseudocreobotra wahlbergi*, Stål. The crickets (*Gryllotalpa africana*, P. de B., and *Gryllus bimaculatus*, de G.) are eaten by the natives, and hand-collecting has proved successful. The operation can be carried out most satisfactorily by providing hiding places in the nurseries, such as grass or pieces of banana leaves, under which the crickets will hide during the day, and can then be easily collected. The habits of the Cacao Fruit Fly (*Ceratitis punctata*, Wied.) are similar to those of the Mediterranean Fruit Fly. Ripe fruit is necessary for the eggs to hatch ; if, therefore, the cacao pods are picked as soon as ripe the maggots will not be fully grown, thus reducing the number of the adults to infect the next crop. The Cacao Beetle (*Adoretus hirtellus*, Castn.) seriously injures young trees under about three years old. Sprays of arsenate of lead at the rate of 3 lb. to 50 gallons of water, and of chromate of lead at the rate of 2 oz. to 4 gallons of water are valuable insecticides, and withstand heavy rains.

*Insects attacking Cotton.*—The Cotton Stainers recorded are *Dysdercus nigrofasciatus*, Stål, D. *pretiosus*, Dist., *Oxycarenus gossypinus*, Dist., *O. hyalipennis*, Costa. No report was received of damage caused by Bollworm (*Earias insulana*, Boisd). Only isolated plants were attacked by scale-insects (*Pulvinaria jacksoni*, Newst.) Several specimens of the parasite, *Tetrastichus gowdeyi*, Crawf., were bred from this scale.

*Insects attacking Tea.*—A scale-insect (*Aspidiotus transparens*, Green) attacks the under surface of the older leaves and covers them. *Ceroplastes ceriferus*, And., has not been found to be a serious pest.

The report concludes with two tables showing a list of 25 species of ticks found in Uganda, together with their hosts and the diseases that they transmit.

ANDREWS (E. A.). **On Insects. Part II.**—*Ind. Tea Assoc., Scientific Dept., Quarterly Jl., Calcutta,* 1913, pt. 2, pp. 33-42.

In the course of this article the following formula is given for use in the nursery against grasshoppers suspected of injuring the young tea plants: Lead arsenate, 1 lb.; jaggery, 5 lb.; water, 100 gallons. Flooding the nursery for a short time, say half a day, appears to be a practical measure against crickets. Another method of dealing with them is by means of poisoned bait, Lefroy's formula being: Husks of rice, 80 lb.; white arsenic, 2 lb.; gur, 4 lb. When the young crickets first hatch, they stay in the burrow, but after a few days emerge and begin to feed, digging fresh burrows for themselves every night; as they grow older they dig deeper, and eventually adopt a permanent burrow. Crickets do great damage to the tea plants, cutting off the tops of the seedlings and dragging them to their burrows. They also do injury to jute, indigo, rice, and many other plants. Owls and bats consume large numbers of these pests, and heavy rains drive them out of their burrows; when this happens birds destroy great quantities of them. Digger wasps and ants are also to be reckoned amongst their enemies.

URICH (F. W.). **The Froghopper Egg-Parasite** (*Oligosita giraulti,* **Crawford) and its colonisation in the Cane Fields.**—*Bd. of Agric., Trinidad and Tobago, Port-of-Spain, Circ.* no. 11, 18th Aug. 1913, 9 pp.

The vermilion froghopper egg-parasite (*Oligosita giraulti,* Cwf.) has been bred from grass from various localities in Trinidad. From experiments it is found that the most suitable stage of the development of the froghopper egg for the parasite is that in which the embryo is well advanced, and that the larval and pupal stages of the parasite take from 22 to 41 days. The adult parasite is very active, and ever searching for froghopper eggs, passing from one piece of grass to another by little leaps. The multiplication of the parasite is by no means so great as that of the froghopper. However, the eggs of the latter require more moisture to hatch than the parasite requires for its development, so that this is a factor greatly to the advantage of the parasite. Another important factor is that the parasite reproduces parthenogenetically and a female is ready to lay one hour after issuing from a froghopper egg. Parasitism of froghopper eggs under normal conditions is probably about 25 per cent. Colonisation of the parasites in the cane-fields is thought to be best carried out by transferring grass yielding parasites by cartloads to fields harbouring no parasites.

KERSHAW (J. C.). **Froghoppers.**—*Bull. Dept. Agric., Trinidad and Tobago, Port-of-Spain,* xii, nos. 72 & 73, Aug. & Sept. 1913, pp. 3-12, 95-101, 3 pls.

The growth of the young sugar-cane could be hastened by a fertiliser and the plants would probably hold their own against the nymphs of the froghopper until grown too large to suffer much damage. Nitrolim, a valuable and fairly cheap fertiliser, which is also of some use in killing the nymphs, is therefore worth an extended trial. The planting of trees and shrubs on waste land adjoining cane fields would encourage the spread of the tick bird (*Crotophaga ani*) and other useful

birds. In Trinidad the cane fields seem deficient in the various native insects and spiders which prey on the adult froghopper, and the author suggests that in the middle of large fields a small plot of cane be left to provide a refuge and breeding place for them. Carbon bisulphide is unsatisfactory as an insecticide for froghopper nymphs under field conditions, as they are, as a rule, hermetically sealed on the rootlet with spittle, which the fumes can only penetrate with difficulty. To be effective, a very large quantity of the chemical would be necessary and the expense would be prohibitive. If trash is left as long as possible on the fields the parasites have a chance of hatching and escaping, and the author believes that if the trash is left lying about and not piled up, it is unfavourable rather than otherwise to the froghopper eggs. There are three artificial methods of control, apart from the Green Muscardine fungus, which promise some measure of success, and which are being tried on a large scale at Chagunas :—(1) Using Nitrolim as a manure primarily, and secondarily against the froghopper nymphs ; it is applied to the roots of the canes by the usual dusters. (2) Kerosene-Lysol emulsion against the adult froghopper. This is very effective if properly applied, as the insect is killed in a few minutes if touched at all by the liquid. Lysol (3 oz.) and kerosene (9 oz.) are mixed in the measure, and then stirred up in 4 gallons of soft water. This 2 per cent. emulsion remains emulsified indefinitely. Kerosene and water is even more effective, but unless continually shaken up will separate almost immediately, and is therefore unsafe for coolie use. When making the experiments an ordinary whisky bottle (27 oz.) was fitted with a cork through which passes a short piece of glass of $\frac{1}{4}$ inch bore, so that it emits a jet, not a spray. A little of the emulsion is shaken into the leaf sheaths where the insects are hiding. This is best done when the canes are small ; when they are more than breast-high it will be far more difficult to apply the liquid. (3) After each brood of adult froghoppers, the old leaves on the growing canes should be examined for eggs, and if any numbers are found, the canes should be trashed and the trash taken at once to the cattle sheds for use as litter, when the eggs will soon be destroyed. If the sheds are unable to deal with all the trash at once, it should be stacked on bare ground away from vegetation until it can be used. On some estates it might be possible to spread it on a piece of waste ground and fold cattle temporarily upon it.

The author insists upon the importance of directing remedial measures especially against the first broods of the insect in the spring, but meanwhile (Aug. 1913) he advises the continued and extended use of trap lights for catching the adults, for the damage done to the cane by the sucking of large numbers of adults on the leaves is very great. It is supposed that a loss of 111 gallons of sap per acre is a very conservative estimate, as many of the factors used in the calculation were kept very low. Observations relating to the feeding of the adult froghopper show that in one hour's continuous sucking it voids about 0·75 c.c. of liquid excrement. There is now little doubt that the Syrphid larva, noted by Gough in 1910, is largely responsible for the diminished numbers of the third froghopper brood. During the larval stage each of them kills several froghopper nymphs, probably a dozen at least. This Syrphid will be found in all localities, wet or dry, where the froghopper exists.

Urich (F. W.). **The Sugar-cane Froghopper and Biological Notes on some Cercopids of Trinidad.**—*Bull. Dept. Agric., Trinidad and Tobago, Port-of-Spain*, xii, no. 72, Jan.-Aug., 1913, pp. 12-34, 7 figs., 6 pls., 3 diagms.

This paper is a complete treatise on the Trinidad froghopper. Records of allied species in adjoining countries are given, and may be summarised as follows: In Mexico, *Tomaspis postica* has been a plague to the grass-lands of the State of Vera Cruz at least since 1880, and is now common in the sugar-cane plantations there. Froghoppers have been found on cane in British Guiana, but so far no damage is reported. In 1883 they appear to have caused some trouble in British Honduras. In Panama specimens of *Tomaspis lepidior* were collected on cane, and an undetermined species of *Tomaspis* was taken in Cuba, but the food-plant is not recorded. In Grenada and St. Vincent froghoppers have been recorded under the name of *T. pictipennis*. In Suriname *T. rubra* has been taken on *Eupatorium odoratum*, and *T. pubescens* is found on grass. An undescribed species of *Tomaspis* was found on grass on the Windward (north) side of Tobago.* The subjects next dealt with are the origin and distribution of the insect, food-plants, and damage done. These are followed by a complete life-history. The uncontrolled progeny of a single female during four wet months is estimated at 20,000 adults. Hence the necessity for doing control work early in the season. The conditions favourable to froghoppers are next mentioned, and it is stated that weeding, burial, or removal of trash, and planting of cover crops are valuable remedial measures. Burning the trash is a procedure which proves unsatisfactory. Seventeen enemies are given: Two birds, the Scissors-tail Flycatcher (*Milvulus tyrannus*) and the Merle Corbeau (*Crotophaga ani*); a ground lizard (*Ameiva surinamensis*); a toad (*Bufo marinus*); several species of Attidae or jumping spiders; a Mite (*Rhyncholophus* sp.); *Phlugis mantispa*; a Mexican Reduviid bug (*Castolus plagiaticollis*) and the Toad Bug (*Galgulidae*); several ants, *Anochetus inermis, Solenopsis geminata, Monomorium* sp.; two species of Chalcididae; a Syrphid fly (*Salpingogaster nigra*); a Nematode (*Mermis* sp.); and two fungi (*Metarrhizium anisopliae* and *Empusa* sp.). In connection with natural control, the author advises an active campaign against the mongoose, as it is the greatest enemy of the ground lizard, which he thinks is worth far more than birds, so far as the froghopper is concerned. Insecticides form the last subject mentioned, and it is said that several experiments against adults and nymphs were undertaken, but none proved effective.

Mention is made of the fact that besides *Tomaspis varia* the sugar-cane froghopper, there are three other species of the same genus occurring in Trinidad. Luckily none of them attack sugar-cane, but as they may be mistaken for *T. varia*, brief descriptions with figures are given of *T. rubra*, L., var. *sororia*, Germ., *T. pubescens*, F., and *T. guppyi*, sp., n.

* [Since described as *T. carmodyi*, Kershaw.—Ed.].

VASSILLIEV (Eug. M.). **Появленіе болѣе значительныхъ количествъ лугового мотылька и личинокъ свекловичной щитоноски.** [The appearance of *Phlyctaenodes sticticalis*, L., in increasing numbers, and also of the larvae of *Cassida nebulosa*, L.]—**Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиковъ за 1912 г.** [*Studies from the Expt. Entom. Sta. of the All-Russian Soc. of Sugar-Refiners for* 1912.] *Kiev,* 1913, pp. 31-45, 5 figs.

The author deals with his observations on the habits of *Phlyctaenodes sticticalis*. In order to prevent the females from ovipositing on the plantations, fumigation by means of smouldering dung, mixed with sulphur, was applied with a certain degree of success. The insects were also caught in fermenting molasses, but it was found out that they are not attracted by molasses in the same way as *Agrotis* and *Mamestra*. Oviposition started in the Governments of Charkov and Kiev in the middle of June, and took place chiefly on weeds, and less frequently on the leaves of sugar-beet, both on fresh and dry leaves. The author pays special attention to the plants which serve as food for these polyphagous insects, and he gives a long list of them arranged according to the system of Professor Vettstein, of Vienna. From this he deduces that these pests, belonging to one of the oldest families (Pyralidae) select their food mostly from the oldest orders of plants—Fagales and Urticales—and those orders which originated from them ; most of the plants attacked belonging to the families Chenopodiaceae and Papilionaceae.

A Sphegid wasp, *Ceratocolus alatus*, Pz., has been observed to destroy the moths of *P. sticticalis* by paralysing them and storing them as food for their larvae ; the cocoons of these wasps are more or less composed of the wings of *Phlyctaenodes*. Other species of this genus also prey upon Pyralid and Tortricid moths.

The author points out that it is not sufficient to mow down weeds round the plantations or on fallow land, but that in order to destroy the eggs effectively it is necessary either to spray the weeds before mowing with a 5–6 per cent. solution of barium chloride or with a 5–10 per cent. solution of iron sulphate, or to burn the mowed grass, having poured some kerosene over it.

The females do not oviposit on the plants on which they feed, but always fly for this purpose to fallow fields, where they lay their eggs mostly on *Atriplex*, an average of 26 eggs being found on one plant, this number rising to 60 in some cases.

VASSILIEV (Eug. M.). **Кормныя растенія нѣкоторыхъ растительноядныхъ насѣкомыхъ и причины, обусловливающія ихъ выборъ.** [Plants serving as food for some herbivorous insects and the causes of their selection.]—**Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиковъ за 1912 г.** [*Studies from the Expt. Entom. Sta. of the All-Russian Soc. of Sugar-Refiners for* 1912.] *Kiev,* 1913, pp. 63-66.

The author refers briefly and in a general way to the relation between insects and their special food-plants, a matter which, notwithstanding its great importance, has been very little studied. A typical instance

of a monophagous insect is provided by the *Phylloxera* of the vine, while there is not a single monophagous insect amongst the pests of sugar-beet. The author deals specially with *Bothynoderes punctiventris*, Germ., which, although polyphagous, discriminates in selecting its food. It feeds on plants of the order Chenopodiacae and on one plant of the order Polygonaceae. Of plants of the former order, it feeds on *Chenopodium album*, L., *Atriplex laciniatum*, L., *Salcola, Beta vulgaris*, L., and, according to some statements, on *Blitum*; of the second order, it feeds on *Polygonum aviculare*, L. The statements of some authors that they have observed this insect feeding on *Nicotiana* (Solanaceae) and *Cucumis melo*, L. (Cucurbitaceae) cannot be accepted as definitely correct without further observations; the author's experiments have satisfied him that it does not feed on plants of the orders Compositae and Papilionaceae. The two orders which serve as food for this weevil are considered to be genetically related, the Polygonaceae being the older and the Chenopodiaceae having probably been derived from them. The author assumes that *Bothynoderes punctiventris* originated at a time when the connection between these groups was closer, *i.e.*, when there were more intermediate forms between them than at present, and that it fed previously on some species of Polygonaceae, but later adapted itself definitely to the Chenopodiaceae. As to the causes determining the selection of plants, they evidently depend on the physical and chemical qualities of the latter. The author refers to the paper by Verschaffelt, " The causes determining the selection of food in some herbivorous insects." (Kon. Akad. Wetensk. Amsterdam, 1910, pp. 546–542), and suggests that perhaps the results obtained by this author may be utilised in applied entomology for the compounding of sprays for the protection of plants.

[Compare also the paper by Dr. I. Trägårdh noticed in this *Review* Ser. B, i, p. 223.]

LEVANDOVSKY (Revd. J.). **Пауки—враги пчелъ.** [Spider enemies of bees.]—**«Русскій Пчеловодный Листокъ.»** [*Russian Bee-Keepers' Gazette.*] *Moscow*, Nov. 1913, pp. 378-387.

The author has paid special attention to this subject, and gives a list of the spiders which kill bees, together with an account of his own observations. The spiders mentioned belong to three families. THOMISIDAE: *Thomisus onustus*, Walck., (*T. albus*, Gmel.), *Misumena vatia*, Cl. (*Thomisus citraeus*, Walck.) and *Misumena tricuspidata*, F. Another genus of this family of spiders, *Xysticus*, is beneficial, as it destroys the spiders of the two former genera. The author describes his observations on one specimen of *Thomisus citraeus*, which settled down on a *Chrysanthemum corymbosum*, L., growing near to a bush of *Hesperis matronalis*, L., from which the bees kept gathering, and sometimes sat down on the former plant to clean themselves; the spider destroyed five bees in six days, perishing itself afterwards from attack by *Pelopaeus pensilis*; the sucking of the victim continued for about 24 hours. The author calculates that on this basis, 100 spiders are able to destroy 10,000 bees during four months of the honey season.

The second family is EPEIRIDAE, the following species being known to be injurious :—*Epeira diadema*, Clerck, *E. angulata*, Cl., *E. cornuta*,

Cl., *E. patagiata*, Cl., *E. selopetaria*, Cl., *Tetragnatha extensa*, L., and *Miranda acalypha*, Walck., the last species having been observed to attack bees only this year. Of the third family, AGELENIDAE, only *Tegenaria atrica*, C.K., is known to the author to prey on bees.

UVAROV (B.). **Отравленныя приманки въ борьбѣ съ саранчевыми.** [Poisoned baits in fighting locusts.]—Reprint from **«Южно-Русская С.-Х. Газета».** [" *South Russian Agric. Gazette*,"] *Stavropol Entomological Bureau, Charkov*, 1913, 11 pp.

The author refers first to some objections raised against the use of " chemical remedies " (spraying) against locusts on the ground that *Stauronotus maroccanus* often lays its eggs in deserts, bare of any plants, thus making it impossible to poison them by spraying, as there are no plants. He is of opinion that locusts very seldom oviposit in deserts, but usually keep near pastures or cultivated land, flying away only short distances to deposit their eggs in steppes ; even these steppes provide some food for the hatched larvae in the form of scattered bush plants, which can be sprayed and poisoned, although he admits that in these cases there will be some waste of insecticides. As to places quite destitute of any plants, evidently the larvae must feed there on something, as otherwise they would starve wholesale, and such cases have not been reported up till now. The larvae in such places feed on various foods, horse-dung for instance, which they would not touch under ordinary conditions. Therefore, he suggests the application of chemical methods in those places by providing food and poisoning it, and quotes a work of D. Morosov, published in 1903, who reports the successful use of various poisoned foods, consisting either of lucerne or other leaves, horse-dung, or bran, imported into such places for that purpose. He refers to the present use of poisoned bait in America, South Africa, and Australia, and reports briefly on the results obtained by this means in the Government of Stavropol during the campaign against locusts in 1913. To make the food more attractive, the lowest and cheapest grades of molasses were added to the bait. A full report on these experiments will be given later.

KURDJUMOV (N. V.). **Птеромалиды, паразитирующіе на гессенской мушкѣ съ описаніемъ двухъ новыхъ видовъ.** [Pteromalid parasites of Hessian fly (*Mayetiola destructor*, Say) with a description of two new species.]—Reprint from **«Энтомологическій Вѣстникъ»** [" *Entomological Herald* "], *Kiev*, ii, no. 1, 1913, 4 pp.

Pteromalids are chief amongst the parasites of the pupae of the Hessian fly, but most of the species have not been sufficiently studied. The following have been recorded in Europe :—*Merisus intermedius*, Lind., *M. destructor*, Say, *Micromelus subapterus*, Riley, *M. rufomaculatus*, Walk., and *Holcaeus cecidomyiae*, Ashm. In Russia the following species have been reared :—*Merisus intermedius*, Lind., *Micromelus rufomaculatus*, Walk., *M. subapterus*, Riley, *Eupteromalus arvensis*, sp. nov., and *Meraporus crassicornis*, sp. nov. The author is of opinion that *M. intermedius* is a synonym of *M. destructor*, and that *M. subapterus* is a synonym of *M. pyrrhogaster*, Walk., the latter in its turn being only a wingless or semi-winged variety of

*M. rufomaculatus*, Walk. The last-named species has always been found by the author as a hyperparasite, and he is satisfied that PTEROMALIDAE usually attack the host when it has already passed into the pupal stage. They frequently appear to be hyperparasites breeding on *Polygnotus minutus*, Lind. A descriptive table of the various species of PTEROMALIDAE is given, and the two new species are described in English. *Eupteromalus arvensis* is a common parasite of Hessian fly in Poltava, Moscow and Kiev, while two females of *Meraporus crassicornis* have been reared from cocoons of the host in Poltava in 1910, and nine in Kiev.

**Tasmanian Insects Pests.**—*Report of the Tasmania Agricultural and Stock Department for* 1912-13, *Hobart*, 15th July 1913, p. 9.

The Director of Agriculture of Tasmania reports that there have been no serious outbreaks of codling moth amongst fruit trees, and the slight outbreak of San José scale in the city of Launceston has been so successfully dealt with that not an insect, dead or alive, was found. The trees received two good winter sprayings with lime and sulphur wash, and every tree on which the live scale was found in summer was also treated then with the sulphide of soda spray. The work was carried out thoroughly, and many gardens in which the scale was found last year and which were treated are now perfectly clean.

METCALF (C. L.). **The Syrphidae of Ohio.**—*Ohio Biological Survey, Bull.* 1, *Ohio State University, Columbus, Ohio*, xvii, no. 31, June 1913, 122 pp., 3 figs., 11 pls.

This is the initial bulletin of the Biological Survey of Ohio, the object of which is to secure accurate and detailed information as to the occurrence, distribution, and ecology of the animals and plants of Ohio. The bulletins will be published at irregular intervals, as the investigations are completed. This volume is divided into three parts. The first covers the following headings: General discussion of the family; general characters; an evolutionary table of larval habits; biological and ecological relations and economic importance of the larvae; ecological relations and economic importance of the adults; enemies and practical measures. The common milkweed (*Asclepias* sp.) is a rather formidable enemy of the adult SYRPHIDAE, as their legs are caught by the pollinia of this plant; thus large numbers of the weaker-bodied flies are entrapped. The parasitic insects of the family ICHNEUMONIDAE are also serious enemies of SYRPHIDAE, at least of the Aphidophagous species. At times fully 75 per cent. of the individuals collected were destroyed by these parasites. Minute Chalcid parasites also prey upon the larvae of *Baccha babista*. Something might be done towards increasing the number of these valuable insects if people could be brought to see that SYRPHIDAE, both as larvae and adults, are among our most valuable friends. Part 2 contains a key to known larvae and pupae of SYRPHIDAE, synopses of life-history studies, and a review of the literature on the biology of the family. Finally, Part 3 gives a key to the genera, a list of Ohio species and a brief bibliography.

Fletcher (T. B.). **Note on Insects Attacking the Paddy Plant in Southern India.**—*Madras Dept. Agric. Bull., Madras*, iii, no. 67, 8th Apr. 1913, 10 pp., 10 figs., 2 pls.

Orthoptera :—*Hieroglyphus banian*, F., occurs in all rice-growing tracts throughout the plains of Southern India. The eggs are laid in masses in the ground, usually between October and December, the young emerge about June, and become mature in about 70 days in the case of males, or 80 days in the case of females. This insect feeds on paddy, sugar-cane and maize, but chiefly on paddy, of which it is a major pest, doing serious damage, both in the adult and hopper stages. The best remedial measure seems to be the catching in small bag-nets of the young hoppers soon after they have hatched out. *Oxya velox*, F., is a smaller grasshopper than *H. banian*, and its life-history is not known in detail. It feeds on paddy, cholam, sugar-cane, etc., and is usually a minor pest of paddy. It is often found in company with *H. banian*, and may be controlled in the same manner by sweeping in bag-nets. The adult grasshopper is sometimes attracted to lights at night, and trial of light-traps is indicated in cases where damage is being done.

Coleoptera :—*Epicauta* sp. This is a small Cantharid beetle, found as a local pest of paddy in South Kanara in October, eating the flowers and also attacking ripe ear-heads. The life-history is not known. Collection of the beetles by hand or in small hand-nets is indicated as a means of control. The Galerucid beetle, *Oides affinis*, Jac., has been found at Shoranur (Malabar), in July and August. Its status as a pest is doubtful, at most it seems sporadic and local. *Leptispa pygmaea*, Baly, a minute Hispid beetle is found chiefly in South Kanara, Malabar, Mysore and Cochin, usually in July and August. The eggs are laid on paddy leaves, and the grubs feed on their upper surface, the attacked leaves usually folding over and hiding the enclosed grub, which, when full-fed, pupates on the leaf, the beetle emerging after about four days. The beetles also eat the leaves, although to a less extent than the grubs. This insect may be a serious pest, and is said to be worst in wet weather. No successful remedy has been devised so far, but bagging by hand-nets may be tried. *Hispa armigera*, Oliv. (*aenescens*, Baly), occurs in all the rice-growing tracts of Southern India, and becomes sporadically a serious pest of paddy. The eggs are laid on the leaves, in which the grubs tunnel, producing discoloured patches, and ultimately pupate in the leaf. No satisfactory remedy has been found so far, but catching the beetles in nets is suggested. *Calandra oryzae*, L., the rice-weevil, can scarcely be considered a pest of paddy, although occasionally found in the field on ripe ear-heads, but it is a serious pest of stored rice.

Lepidoptera :—*Melanitis ismene*, Cram., is found throughout Southern India, occurring from sea-level to elevations above 7,000 feet. The pale green caterpillar feeds chiefly at night and sometimes attacks paddy, but as a rule does very little damage. *Parnara mathias*, F., the rice-skipper, occurs throughout the plains of Southern India, but is a minor pest of paddy, as a rule, its numbers being kept in check by various parasites and predators. The caterpillar lives in leaves rolled longitudinally. *P. colaca*, Moore, has been found on paddy at Saidapet and Madras, but is not a regular pest. Another

skipper, *Telicota augias*, L., is a minor pest of sugar-cane, but is stated to feed on bamboo and paddy. It has not been noted as doing any real damage. *Cirphis unipuncta*, Haw., the army-worm, occurs throughout Southern India, chiefly in October and November. The caterpillar is a minor pest of cholam, occasionally attacking paddy, maize, etc. Protection of cultivated tracts by digging narrow steep-sided trenches around them is usually the only practical measure to prevent attack when the caterpillars are swarming. *Spodoptera mauritia*, Boisd., occurs throughout Southern India, and the caterpillar sometimes does considerable damage to seedling rice-plants. The eggs are laid usually on the under-surface of blades of grass or paddy, in batches covered by buff-coloured hairs from the female moth. The caterpillar feeds at night, and when full-fed pupates in the soil, the moth emerging after about ten days. In the case of small areas, such as seed-beds, the following control measures may be adopted :—(1) Protection of seed-beds by surrounding them with narrow steep-sided trenches ; (2) collection of egg-masses ; (3) spraying ; and (4) flooding of area and turning in ducks. This last method is used successfully in some districts. *Sesamia inferens*, Wlk., occurs throughout Southern India, the caterpillar being a bad pest of ragi, and often found as a minor pest of maize, cholam, paddy, wheat and sugar-cane. The caterpillar bores inside the stem, pupating in the larval burrow. The attacked plants show dry ears, and destruction of these is indicated to prevent extension of the attack. *Remigia frugalis*, F., is occasionally a very minor pest of paddy throughout Southern India. The caterpillar feeds exposed on leaf-blades. *Psalis* (*Dasychira*) *securis*, Hb., is a minor pest of paddy throughout the plains of Southern India. Pupation usually occurs on a leaf-blade in a cocoon formed of silk, interwoven with larval hairs ; the pupal period is about ten days. The caterpillars are conspicuous and feed exposed, and are therefore easily collected by hand. *Ancylolomia chrysographella*, Kollar, is found throughout Southern India, the caterpillar feeding on paddy, *Paspalum dilatatum*, and probably on all grasses. It has only been found on one occasion as a serious pest of paddy seedlings, but is liable to occur at any time in dry sandy localities. The pale green caterpillar feeds at night, remaining during the day in long tubular galleries lined with silk at the roots of its food-plant. Pupation occurs in the larval gallery ; the pupal period is about ten days. Control measures include (1) flooding of affected areas to bring up the caterpillars, which are greedily devoured by crows, etc. ; (2) spraying of plants (in small experimental areas, seed-beds, etc.) ; and (3) attraction of moths by means of light-traps at night. *Schoenobius bipunctifer*, Wlk., the paddy stem-borer, occurs throughout the plains of Southern India as a very serious pest. The eggs are laid on leaves in clusters, covered with yellowish hair. The caterpillar bores into the stems of the paddy and pupation occurs in the larval burrow, which is lined with silk. The moth emerges through a hole previously cut by the caterpillar through the side of the stem. No really successful control-measure can be given as yet, but to reduce the damage the following means are suggested :—(1) Ploughing and, if possible, burning of paddy-stubble after the harvest is gathered ; (2) collection of egg-masses, which are conspicuous ; and (3) attraction of moths to light-traps at night. *Nymphula depunctalis*, Gn., is a serious pest of paddy

throughout Southern India. The caterpillar is semi-aquatic, living in cases made of rolled pieces of leaf, and is furnished with bunches of slender filamentous gills along the sides. It crawls up the plant above water-level and feeds on the green tissues of the leaf. Pupation occurs in the larval case. Draining the water off the affected fields is indicated as a remedy, but this is rarely possible in practice, as this pest is chiefly found in low-lying, water-logged areas. In some districts, a thorny bush is dragged over the field to dislodge the larval cases, and the water is then drained off; it is, however, difficult to see what is the value of the thorny bush, and the draining of the water is evidently the important factor where success is claimed for this method. *Cnaphalocrocis medinalis*, Gn., occurs throughout Southern India, and is a minor pest of paddy as a rule, occasionally doing considerable damage in the Northern Circars. It is not known as a pest in the southern parts of Madras. The caterpillar lives inside folded leaves, of which the tip is fastened over the broader basal part; it eats the leaf tissue so that the leaves become whitened and sickly. No remedial measures, applicable on field scale, can be suggested at present.

THYSANOPTERA:—Various species of Thrips occur on paddy, but they have not been worked out.

RHYNCHOTA:—*Menida histrio*, F., is found throughout Southern India as a minor pest of paddy; also on wheat, cholam and pulses. Collection by hand-nets is indicated in the case of small areas. *Tetroda histeroides*, F., has been found at Salem and Coimbatore as an occasional minor pest of paddy. Collection by hand and by hand-nets is suggested on small areas. *Leptocorisa varicornis*, F., the rice-bug, occurs throughout Southern India as a serious pest of paddy, especially on the West Coast. The eggs are laid in rows on leaves of paddy and grasses. The bugs especially attack the ripening grain, sucking the milky juice, so that the ears turn wholly or partly white, no grain being matured. Collection in hand-nets has been found the most efficient method of control. *Tettigoniella spectra*, Dist., a small white Jassid, occurs throughout Southern India in paddy fields. It has not actually been noted to be a pest, but may at times do some damage. The adults are strongly attracted to light at night, and this fact may be utilised as one means of control. *Nephotettix bipunctatus*, F., occurs on paddy on the plains of Southern India; it is probably a minor pest. The adults also fly freely to light.

**Thrips and Cacao Beetles.**—*Bull. Dept. Agric., Trinidad and Tobago*, xii, no. 72, Aug. 1913, pp. 66-70, No. 74, Oct. 1913, p. 136.

Mr. Rorer furnishes the following report on the cost of spraying cacao. Against Thrips it is necessary to spray both leaves and pods, and the figures given are for this method. A barrel outfit, costing about £10, or a set of compressed air knapsack-sprayers, costing about £20, will, under favourable conditions, spray about 500 trees a day; so if it is necessary to spray 1,000 a day, from £20 to £40 must be invested in apparatus. One man should spray at least 75 trees a day, or 100 if they are small, and if facilities for spraying are good, so that 15 men should be well able to cover 1,000 trees a day. The cost of the spray mixture itself depends on the materials and quantity used. Bordeaux

mixture costs about £1 13s. per 1,000 gallons, or £3 6s. if 80 lb. of arsenate of lead are added. One per cent. lysol costs about £2 per 1,000 gallons, and nicotin sulphate solution about the same. Kerosene emulsion is still more expensive. On the average, three-quarters of a gallon of spray mixture is required per tree, so that 1,000 gallons will cover 1,300 trees. These figures work out approximately at a maximum of £3 per 1,000 trees per application. Spraying with Bordeaux mixture alone is much cheaper than this. All things considered, the cost per 1,000 trees would be about £2. This can be reduced by one-half or two-thirds if the fruit alone is sprayed. The cacao spraying experiments were showing up well this year ; not only were the sprayed trees yielding better, but there was very little black cacao, while in unsprayed places the percentage of black cacao was very high.

Mr. Urich has noticed that when a certain insecticide turned out to be good, and a demand was made on it, it generally gave out, and much time elapsed before more could be had, even if telegraphed for. That especially applied to lysol. A search is being made for natural enemies of the cacao Thrips, and one may be found in Trinidad or some other island. Later on, Mr. Urich reports a decrease of the insects, but recommends a careful watch for their appearance on the pods. As soon as this takes place the pods should be sprayed. Thrips yield to good cultural methods very easily.

The ravages of the cacao beetle (*Stirastoma depressum*) are quite as bad, if not worse, than those of Thrips. Energetic application of trapping, and spraying with arsenate of lead is recommended. Arsenate of lead can also be very well applied to small trees with a good-sized paint-brush.

At the September meeting of the Board of Agriculture, Mr. Urich stated that he observed but few Thrips on his recent visits to the districts of Sangre, Grande, and Caparo, nor had he any reports of their prevalence in numbers in other places. The rains appeared to be keeping them in abeyance.

Adult cacao beetles were just appearing, and it would be well to collect and trap them before they had time to lay eggs. In places where Thrips or cacao beetles are known to be troublesome, spraying should be carried out during October. For Thrips it is recommended to use Bordeaux mixture and lysol in the proportion of one to two gallons of lysol to every 100 gallons of mixture. For cacao beetles Bordeaux mixture with 4 to 8 lb. of arsenate of lead to every 100 gallons of mixture should be used.

Rorer (J. B.). **The Green Muscardine Fungus.**—*Bull. Dept. Agric., Trinidad and Tobago, Port of Spain,* Sept. 1913, xii, no. 73, p. 105.

A point of great economic importance is that infections with the disease can be brought about as early in the season as the froghopper appears. The author saw dead froghoppers of the first brood covered with the fungus two weeks after the spores were applied, and this was much earlier than he ever observed natural infection taking place. He mentions that a few fungus cultivating cabinets have been constructed in Porto Rico, where certain beetles which attack sugar-cane

are found to be killed by this fungus. This is also the case in Illinois, where it is used to combat an insect pest of Indian corn. In Illinois a trial is being made of burying the fungus in the soil.

**Two Useful Spray Fluids.**—*Ind. Tea Assoc. Scientific Dept. Quarterly Jl., Calcutta,* 1913, pt. 3, pp. 79-84.

Bordeaux mixture attains its maximum efficiency when the copper sulphate and lime (calcium hydrate) are mixed in the exact proportions necessary to form copper hydrate. Any excess of either constituent impairs the activity of the mixture, and loss of efficiency means loss of money. A properly made mixture may be much more efficient than a carelessly made one containing double the percentage of materials. Besides being the best general fungicide, it improves the health of the plant, and it has been proved that its use on leaves and fruit intended for human consumption is in no way detrimental to the consumer. The following quotation from the eighth report of the Woburn Experimental Fruit Farm (1908) explains very clearly the best method of making this mixture at present invented :—

"One hundred gallons of such mixture is prepared as follows :—Dissolve 6 lb. 6½ oz. of crystallised copper sulphate by suspending it in a piece of sacking in two or three gals. of water in a wooden or earthenware vessel. Take about 3 lb. of good quicklime and slake it in a little water, then put it into a tub with 120 gals. of soft water. Stir the lime and water, then leave it to settle until the liquid is quite clear. Run off 86 gals. of the clear lime-water and mix it with the copper sulphate. Make up to 100 gallons with soft water. However the Bordeaux mixture is made, it is important to make sure that all the copper is thrown down. The most certain test that fruit-growers can use is to put a few drops of a solution of potassium ferrocyanide into a white saucer with some water, and to drop into this some of the clear liquid after the Bordeaux mixture has settled. A red or brown colour shows that there is copper in solution, and more lime water must be added until the test shows no coloration."

Originally used as a sheep-dip, lime-sulphur has been proved to be one of the best fluids for winter application to dormant trees, both as a fungicide and as an insecticide, and it has the additional advantage of stimulating the growth of the plant. The lime used should be the best commercial quicklime (stone or lump stone) ; air-slacked lime is useless. It is most undesirable that more than five per cent. of magnesium oxide be present. To test the amount of impurity in quicklime, the following simple method is useful. The apparatus required consists of (1) a glass cylinder about 2½ inches in diameter and 15 inches high, which should be graduated in cubic centimetres, and (2) a boiling vessel to hold about three pints. A quart of water should be poured into the vessel, and the level at which it stands should be marked on a piece of stick held vertically ; then pour out the water. Weigh out carefully 2 oz. of the lime to be tested, place in the vessel and slake with water, adding the water gradually, not covering up the lime with it until the slaking is complete. Then stir the slaked lime into a paste with more water, continuing to add water until the level marked on the stick is reached, and then boil. Weigh 4 oz. of flowers of sulphur and stir vigorously into the boiling lime-water.

Boil gently for one hour, filling up to the mark with more water every ten minutes, stir quickly and pour into the glass cylinder. Allow it to stand overnight, and then measure the amount of the sediment in cubic centimetres. In the following figures, given by the author, the first represents the number of cubic centimetres of sediment, the second the appoximate percentage of impurity, the third the weight of the lime used, necessary to replace effectively 36 lb. of pure lime: 30—5 per cent.—38; 50—10 per cent.—40; 70—15 per cent.—42; 90—20 per cent.—45; 105—25 per cent.—48; 120—30 per cent.—51. The standard formula given is: best commercial quicklime, 36 lbs. finely divided sulphur, 80 lbs.; water, 80 gallons. It is unwise to use lime containing more than 10 per cent. impurities, as the sediment clogs the spraying machines.

**Another Cockroach Poison.**—*Agric. News, Barbados*, 27th Sept. 1913, p. 314.

Under the heading Insect Notes, there is given a formula recently tried in Barbados with apparently very good results. It contains naphthalene and boric acid in equal parts, the naphthalene being finely powdered before being mixed with the boric acid. This mixture has been sprinkled plentifully in the haunts and hiding places of cockroaches at intervals of about two weeks, and after two or three applications the insects almost entirely disappeared.

The following abstracts are taken from the monthly journal **« Туркестанское Сельское Хозяйство »**—[*Agriculture of Turkestan*], published at Tashkent.

**Notes on insect pests.**—*Agriculture of Turkestan*, no. 6, June 1913, pp, 585-590.

An editorial note deals with the multiplication of *Stauronotus maroccanus* in the province. This pest has all but disappeared since the campaign of 1911, and no damage by it was reported during the last three summers. Gradually, however, the broods of the remaining locusts—it is impossible to destroy all the insects without a single one being left—have increased, and in 1912 although no swarms were noticed, their egg-clusters were found in various localities. In the province of Samarkand it was necessary again to organise a campaign against them in some places, and their egg-clusters were also discovered in the district of Tashkent, which will necessitate renewed efforts in fighting them next year.

In South Eastern Bokhara the record in 1912 proved the existence of egg-clusters over an area of 274 square miles, and £32,500 was assigned to fight them. The use of the new insecticide, sodium arsenate, gave excellent results; portable iron sheets were also very useful. A field telephone was also brought into use for the first time, and greatly facilitated the communications between the separate parties. The insects are reported to have been destroyed by *Pastor roseus* (Rose Starlings). No migrations of the pests from Afghanistan were noticed this year, owing firstly to the gradual decrease in their numbers in that country, and to the fact that this year they flew to the south, in

the direction of Kabul; thus the campaign ended with great success. No damage to crops was done, and only small numbers of locusts remained, as in Turkestan in 1911.

*Caloptenus italicus* appeared in many parts of Turkestan, and also in great numbers in the streets of Tashkent. Some damage to wheat crops was done by this pest near the river Kashka-Darya, and observations have shown that about 80 egg-clusters were laid on one square foot. Serious damage to crops was also done by this locust in company with *Arcyptera truchmana* in the settlement Novo-Michailovsk, situated on the left bank of the river Tchirick. Another note relates to migatory locusts (*Locusta migratoria*), which hatched in 1912 in great numbers in their usual breeding places, the districts of Perovsk and Kazalinsk and the delta of the Amu-Darya. Notwithstanding the great numbers of egg-clusters there was no outbreak of these locusts in the district of Perovsk, owing to the overflow of the Syr-Darya during this spring when the clusters evidently were destroyed. According to statements from competent sources, it is hardly possible to fight this insect in these parts of the country, owing to local conditions, and usually no remedies are applied.

According to a statement by M. M. Siazov, *Epicauta erythrocephala*, which is very useful, as its larvae destroy egg-clusters of locusts, has done some damage to crops in the current year (1913), as well as last year. Potatoes and clover seem to have suffered most.

It appears that very few pests of field crops have been noticed this year, and neither the larvae of *Caradrina* nor those of *Hylietus*, which injure cotton seeds and tomatoes, occurred in quantities worth mentioning, except on one estate where the last-named pest appeared, but was successfully destroyed. Pests of orchards were very active, and *Cydia pomonella*, *C. funebrana*, *Rhynchites auratus*, *Pollyphylla adspersa*, various plant lice, etc., did much damage as usual.

SMIRNOV (D.). **Борьба съ персиковой тлею, термитами и муравьями при помощи карболинеума.** [The fight against *Lachnus persicae*, Chol., termites and ants by means of carbolineum.]—*Agriculture of Turkestan*, no. 8, August 1913, pp. 783-786.

The author records his attempt to control *Lachnus persicae*, an aphis which does great injury to peaches in the Murgab estates, by smearing carbolineum over the trunks and over the larger injured branches of the trees. This was done in December, and in the case of ten trees the smearing was applied too thickly, so that the author was obliged to wash a part of it away with kerosene; the further development of the trees was not satisfactory, and out of 16 smeared trees only 11 recovered, four recovered only partly, and one died. The author explains these unfavourable results as being due to the carbolineum having passed through the bark into the cambium, plugging the vessels. He is of opinion that the smearing ought to be done during the vegetative period in March and April and during wet weather.

He further reports excellent results obtained by him in his house by using carbolineum against termites and ants (*Hodotermes turkestanicus*, Jacobs, and *Camponotus maculatus turkestanicus*, Em.).

These insects evidently cannot stand the smell of carbolineum, and by smearing it over the wooden parts of the buildings, especially in places where the exits of the insects are situated, he was able practically to free his house from them.

An editorial note to this article calls attention to the fact that in the author's experiment with carbolineum on peach trees he brought in accidentally another material—kerosene—and it is not proved which of the two was injurious to the trees. [See this *Review*, Ser. A, ii, p. 6].

**Parasites of *Chloridea* and the Codling Moth.**—*Agriculture of Turkestan*, no. 8, August 1913, pp. 810-813.

An editorial note deals with a parasite of tomato-worms, under which name the caterpillars of *Chloridea* are popularly known in Turkestan. Near Tashkent tomatoes were seriously damaged during last year (1913) by two species of *Chloridea*, *C. obsoleta* and *C. dipsacea*; there was also a caterpillar of a third species which remained unidentified. These caterpillars are very injurious, feeding day and night on the fruit. S. N. Bogoljubov, from the Entomological Station, has been studying these insects, and found a parasite of them. The name of the latter is not given, but a description of it is supplied; the females kill the caterpillars with their ovipositor, feeding on their blood and depositing eggs on the killed insect. The parasites prefer the blood of fresh victims and pass from one caterpillar to another. In the laboratory some females have killed as many as eight caterpillars during their life and deposited on them about 100 eggs. The development of the parasite from egg to imago lasts eight to fifteen days, thus a large number of generations is bred during one summer. Males of this parasite were also noticed. It is suggested to assist the breeding of these parasites by keeping the dead caterpillars, found near tomato bushes in a box with a wire-netting lid, so as to enable the hatched parasites to escape; such a box should be put in a tomato field on a sheet of glass or other support, protected by varnish from ants. A more detailed report is expected from Bogoljubov after the conclusion of his observations.

Another note relates to the parasite of the egg of *C. pomonella*, imported in 1911 by Radetzky from Astrachan [*Trichogramma semblidis*.] Last year (1913) they were found by Troitzky in many orchards of Tashkent, besides those in which they were released in the preceding years. In 1912, Plotnikov found these parasites in Ferghana, where no imported specimens were released. In 1913, they were found in the districts of Samarkand and Ferghana. Whereas the parasites in Tashkent are exclusively parthenogenetic females, in Ferghana both sexes are found, and the parasites hatch from fecundated eggs; the parasites in Samarkand, where also both males and females are found, differ in colour.

It is reported that in the garden of the governor of Ferghana, where enormous quantities of these parasites were found, and where in the first half of July all the eggs of *C. pomonella* were infested by them, there were also found large quantities of caterpillars of the codling moth. The information obtained will decide the question as to whether the imported parasites have been able to acclimatise themselves in Turkestan or whether there are local representatives of them.

Miroshnitchenko (A.). **Истребленіе шершней и осъ на пасѣкахъ и виноградникахъ.** [Destruction of hornets and wasps in bee-hives and vineyards.]—*Agriculture of Turkestan*, no. 9, September 1913, pp. 931-934.

The author suggests a new method of destroying wasp-nests, which he has applied with success. He used a soldering lamp, which gave a flame of about 5½ inches long. By directing the flame into the nest, it was possible to remove the latter, and also to destroy it, by burning it with the same lamp, without being subjected to stings from the insects; the strong glare keeping the wasps back and not allowing them either to protect themselves or to escape. The author has destroyed in this way 111 nests of wasps without being stung.

It appears from the author's remarks that wasps are a most serious pest in that country and, according to statements of persons knowing South European Russia and the Crimea, there is no place where wasps are so abundant as in Turkestan.

Plotnikov (V.). *Pachydissus* **attacking Poplars.**—*Agriculture of Turkestan*, no. 10, October 1913, pp. 1038-1040.

In reply to a correspondent who sent in an insect pest which has done great damage to poplars and other trees in Kokanda, the author identified the species as *Pachydissus sartus*, Sols., and gives information as to its habits. As a remedy he suggests cutting out and burning the damaged trees; the remaining trees must be kept in a healthy state, and any parts of them damaged from other causes must be smeared over with carbolineum, tar or pitch, adding creosote or carbolic acid.

Deriabin (P.). **Личинки щелкуна, какъ вредители хлопчатника.** [Larvae of a species of *Elateridae* as pests of cotton.]—*Agriculture of Turkestan*, no. 10, October 1913, pp. 1040-1041.

The author reports damage done to cotton by larvae of a species of Elateridae. He first noticed this on the 21st April in a cotton plantation in the district of Samarkand; the larvae gnawed through the collar of the root in plants which had already sprouted, also injuring the cotyledons of seedlings. The plants suffered most in their first two stages, while later they were better able to withstand the attacks of the pests. On the date given, the larvae were found at a depth of 2½–3 inches below the surface of the soil; on the 11th May they stopped injuring the plants and were found at a depth of 4–4½ inches; searches made in the first half of June resulted in no larvae being found, they having evidently passed to a considerable depth into the earth.

Sevastjanov (J.). **Кровяная тля и мѣры борьбы съ ней.** [*Eriosoma* (*Schizoneura*) *lanigerum* Hausm., and remedies against it.] —*Agriculture of Turkestan*, no. 11, November 1913, pp. 1103-1128, 10 figs.

The author starts with a general historical review of the spread of this pest, and particularly in Russia, where it appeared first in the

Crimea in 1862, spreading in the seventies of the last century to Sotchi and thence to Transcaucasia. As to European Russia, the special investigations conducted by the Ministry of Agriculture in 1896 in the Governments of Bessarabia, Cherson, Podolia, Ekaterinoslav, Taurida, Charkov, Poltava, Kiev, Volhynia, Tchernigov, Kursk, Orel, Smolensk, Mohylev, Poland, and the Don district, showed a total absence of the insects in those areas, its habitat being thus limited to the Crimea and the Caucasus; indeed, fruit-growers in South-Western Russia have often received young apple trees infested with these plant-lice, but the latter have disappeared. The author quotes Mokrzecki, according to whom these lice are less injurious in the Crimea than in Western Europe, which he explains by the fact that in the former country the development of the pests is checked by the unfavourable weather conditions, which the insects meet with in a greater degree the further they move towards the east. Other authors, however, consider these lice to be very injurious, and Rollov, who studied the insects of the Caucasus, gives instances of young trees attacked by *E. lanigerum*, perishing in two to three years, while the yield of fruit on older trees attacked was gradually reduced to nothing. In 1896 special regulations were issued in the Crimea as to the fighting of *E. lanigerum*; these regulations empowered the District Zemstvo of Simferopol to deal with this question through a special committee appointed by the Zemstvo and special superintendents in various districts; they made the notification of the appearance of these pests compulsory upon the owner of an orchard, and while leaving to him the selection of proper remedies, empowered the district superintendent to act on account of the owner in case the latter failed to take the necessary measures, or if the remedies applied by him proved of no effect. They further prohibited the sale and export of trees from nurseries attacked by the pests, and authorised the Zemstvo to destroy trees which, in the opinion of the district superintendent, could not be saved.

As to Turkestan, the appearance of *E. lanigerum* was mentioned in the report of Plotnikov for 1911, and although the injuries done by them are less than those done by other sucking insect pests, there are signs that they are increasing, and they may prove very injurious in the near future. The author thinks that it would be premature to compel the native population to take drastic measures against these lice, as this may have an opposite effect, by creating mistrust of the entomological organisations of the country, which, up till now, have been able to interest the native population in their activity. He addresses himself to the Russian population, urging the necessity of applying energetic remedies during the coming winter.

The author goes on to describe the insect in its various forms, and its bionomics, and points out that there are no parasites known to destroy them. Their known enemies are the larvae of some rapacious beetles, especially lady-birds, and he quotes a statement by Shevirev, who observed the destruction of whole colonies by the larvae of *Euproctis chrysorrhea.*

As preventive measures he suggests the disinfection of nursery stock with carbon bisulphide, describing the method of application, and also the keeping of the trees in a clean healthy state by scraping off the dead bark, smearing with milk of lime, manuring of slow-growing

trees and taking care to smear any wounds on the trees with tar or some greasy material. He recommends the destruction by burning of infested branches or trees, whenever possible, if the trees attacked are not too valuable to be destroyed, and the destruction of the lice by crushing them, even by hand; insecticides may be usefully applied late in autumn and in winter when the lice lose their "down." In crushing the lice with brushes, the use of a poison—Nessler liquid—is recommended, as described by Mokrzecki (about 5½ oz. of green soap, a quarter of a pint of amyl alcohol, one-eighth oz. of carbolic acid, and eight pints of soft water). When the lice are discovered on the roots, the latter may be safely sprayed with this mixture, or, as recommended by Rollov, the earth round the trees must be dug to a depth of about 3–3½ feet, a solution of milk of lime in water poured over the roots, the latter being afterwards covered with slaked lime and earth. Smearing with carbolineum, and spraying with kerosene emulsion and with quassia is also recommended; for kerosene emulsion the following recipe is given by Plotnikov: 1¾ oz. of caustic lime, 3 lb. of kerosene, and 2·7 gals. of water. Radetzky has recommended smearing the trees with a solution of ½–¾ lb. of naphtha soap in 2·7 gals. of water.

A list of eleven Russian works on the subject concludes the article.

Crawford (D. L.) **Control of the Orange Maggot** (*Trypeta ludens*).—*Mexico Gulf Coast Citrus Association, Tampico, Circular* no. 1, 17th Sept. 1913, 5 pp.

The pest known as *Trypeta ludens*, or the orange maggot or fruit fly, is a very serious one. Its attacks are not limited to citrus fruits, of which the following have been found to be infested: Grape-fruit, navels, Boone's Early, Hart's Late, tangerines, citrons, sweet limes and sour-oranges. The eggs are laid within the skin of the fruit in a small puncture made by the ovipositor of the female. They hatch in about ten days, and the tiny maggots eat into the pulp, decay sets in and the fruit drops. After three weeks inside the fruit the maggots work their way into the ground and pupate, and the fly emerges nearly a month later. From egg-laying to the emergence of the adult occupies about three months. The control method already practised, frequent collection and destruction of the fallen fruit, is effective to a certain extent, but poisoned baits should also be used. All fallen fruit should be buried in a deep pit and covered with at least two feet of soil. Burning the fruit is more satisfactory, provided it be done thoroughly, for the maggots are very resistant to heat. Incinerating furnaces are the best for this purpose. The formula for preparing the bait spray is as follows: 6 lb. of dulce syrup (thick), 1 lb. of arsenate of lead (paste), 20 gals. of water. If this cannot be obtained, the following substitute may be used: 1 lb. of white arsenic, 4 lb. of sal soda (washing soda), and 1 gal. of water. Boil these ingredients in an iron vessel for about twenty minutes, or until dissolved. The liquid thus made is arsenite of lime, and must be diluted. It is less satisfactory than arsenate of lead, because it is washed off the trees more easily. This stock solution of arsenite of lime is to be used as follows: 6 lb. of dulce syrup (thick), one pint of arsenite of lime, 4 lb. of freshly slaked lime, and 20 gals. of water. The lime absorbs any free arsenic which would

injure the foliage. One pint of the liquid is sufficient for one tree, and it may be sprayed on the lower and middle branches and fruit. If there is no rain, the bait will last effectively on the trees for about ten days. Success largely depends on applying the spray for the first flies, as well as for the last ones.

ASHBY (S. F.). **Annual Report on the Department of Agriculture for the year ended 31st March 1913.**—*Jamaica, Kingston,* 1913, p. 30.

S. F. Ashby reports that scales have been severe during the drought, on orange and grape-fruit. The two most destructive scales were the purple mussel scale (*Lepidosaphes beckii*) and the citrus snow scale (*Chionaspis citri*) on trunks, branches and twigs mainly. Of less importance on leaf and fruit, were the red scale (*Aspidiotus articulatus*) and the red spot scale (*Chrysomphalus aonidum*). The purple scale is widely parasitised by a Chalcid (*Aspidiotiphagus citrinus*, Crwf)., and in wetter districts by the " red-headed fungus " (*Sphaerostilbe coccophila*).

PIERCE (W. D.) **The Occurrence of a Cotton Boll Weevil in Arizona.**—*Jl. Agric. Research, Washington,* i, no. 2, 10th Nov. 1913, pp. 89-96, 9 figs. 1 pl.

In February 1913, an insect resembling the cotton boll weevil was found breeding in the bolls of a wild shrub known as *Thurberia thespesioides* in Ventana Canyon, Arizona. In May, the author obtained a large quantity of heavily infested bolls of *Thurberia* from the lower part of Stone Cabin Canyon, Arizona. A close examination of the material disclosed many minor points of difference from the usual form of the cotton boll weevil, *Anthonomus grandis*, Boh. In addition to these differences of structure, certain differences of habit were noted ; it was found, however, that *A. grandis* would feed upon *Thurberia*, while the Arizona species would equally feed on cotton ; and it was possible to obtain crosses of the two forms. It is, therefore, decided to regard the two as being merely different varieties of the same species. For the Arizona variety the name, *Anthonomus grandis thurberiae*, var. n., is proposed. A systematic description and an account of the life-history are given.

The Arizona weevil may be able to cover considerable distances by flight, especially if compelled to seek sustenance elsewhere. It will, however, probably cleave to its native food-plant so long as this gives sufficiently abundant food, but should the supply for any reason become scarce, it is to be feared that the weevil will take to cotton, to which it would do considerable damage. It is thought that a wholesale destruction of the native food-plant might merely cause the insect to turn its attention to cotton. The matter is now under investigation, but at present it is the author's opinion that the safest plan is to preserve the *status quo* of the weevil in the mountains. An introduction of parasites from the cotton boll weevil would be of considerable assistance in reducing the Arizona weevil, and would not cause its dispersal.

The cotton boll weevil has never been able to invade successfully

the drier cotton sections of western and north-western Texas, although it is probable that it will gradually adapt itself to the more rigid conditions obtaining there. It is of extreme importance that the Arizona weevil be kept out of western Texas and any part of the south-east. If accidentally introduced into other sections, there is reason to believe that it might be able to stand much greater variations of climate than *Anthonomus grandis*, and become a much more serious pest.

DOBROVLIANSKY (V. V.). **Къ біологіи тлей плодовыхъ деревьевъ и ягодныхъ кустовъ.** [On the Biology of Aphis pests of tree and bush Fruit.] **Кіевская Энтомологическая Станція при Южно-Русскомъ Обществѣ Поощренія Земледѣлія и Сельской Промышленности.**—[Pubd. by the *Kiev Entomological Station of the South-Russian Agricultural Syndicate*], *Kiev*, 1913, 48 pp.

This memoir is the result of observations on aphids collected by the author during the summer of 1912 around Kiev; his primary object being the study of the life-history of *Aphis pomi*, de G. He first gives the following list of aphids found on certain fruit trees, but does not claim that it is exhaustive. On fruit trees of the genus *Pirus*:—*Myzus mali*, Ferr., *M. pyrinus*, Ferr., *M. pyrarius*, Pass., *Aphis pomi*, de G., *A. fitchi*, Sand., *A. sorbi*, Klt., *A. crataegi*, Klt., *A. pyri*, Koch, *Schizoneura lanigera*, Hausm., *S. pyri*, Goethe, *Rhizoctonus ampelinus*, Horv., *Phylloxera piri*, Mokr. On fruit trees of the genus *Prunus*:—*Phorodon humuli*, Schr., *Rhopalosiphum persicae*, Sulz., *Myzus cerasi*, F., *Hyalopterus pruni*, F., *Aphis prunorum*, sp. n., *A. prunina*, Walk., *A. cerasina*, Walk., *A. persicae*, Klt., *A. pruni*, Koch, *A. prunicola*, Klt., *Lachnus persicae*, Chol. On bush fruit of the genus *Ribes*:—*Rhopalosiphum ribis*, L., *Myzus ribicolus*, Klt., *M. ribis*, L., *Aphis grossulariae*, Klt., *Schizoneura ulmi*, L., (*fodiens*, Buckt.), *S. grossulariae*, Schule. On bush fruit of the genus *Rubus*:—*Macrosiphum rubi*, Klt., *Aphis idaei*, Goot., *A. urticaria*, Klt., *A. mordwilkiana*, sp. n.

*Aphis pomi.* The author found these aphids mostly on apple and pear trees; also on white thorn, *Cydonia vulgaris*, Pers., (quince), *Mespilus germanica*, L. (common medlar), and on *Cotoneaster vulgaris* Lindl. (medlar var.) On apple and pear trees they first suck the buds, then the lower sides of young leaves and shoots; from June onwards they are found mostly on the lower sides of leaves of apple, while on pear trees they are found less frequently; in the autumn they were found only on the leaves of apple. The development of the larvae, from birth till after the last moult, occupied 2 weeks in April, while in May and in June it was only 10 days. The number of larvae produced by each parthenogenetic female was 25–30, in the case of wingless specimens, and 20–25 in the case of winged ones. Amongst their natural enemies the author records, *Exochomus quadripustulatus* in April, while in June larvae of another ladybird were found, as well as those of Syrphid flies; in July and August the larvae were destroyed by the larvae of *Bremia*, as well as by *Coccinella* 14-*punctata*, L., in August. Some specimens were infected by a parasite, and the author reared some secondary parasites: *Pachyneuron aphidis*, Bouché, *Encyrtus aphidivorus*, Mayr, and *Lygocerus* sp. The author is satisfied (1) that there is no total disappearance of these aphids from apple trees during the summer, but that they pass their whole life-cycle on them;

(2) that it is most unlikely that any migrations take place ; (3) that the decrease in their numbers depends upon the decrease in the fertility of the viviparous females ; dissections of females taken at different periods of the season have shown that their fertility remains constant from May to July, while it decreases by one-half in August.

*Aphis sorbi* was rare. The author did not find them on cultivated fruit trees, although other observers report that they attack apple.

*Aphis crataegi*. According to Mordvilko this species migrates during the summer from the white thorn to certain grasses which serve as intermediate hosts ; the second generation consists almost exclusively of winged migrating females, which start a new generation on *Ranunculus*. These were previously considered to be a distinct species, *Aphis ranunculi*, Klt. The author's observations have confirmed the statements of Mordvilko. Besides white thorn, he found the stem-mothers also on apple trees. On the same trees he found also, inside some curled leaves, aphids which strongly resembled specimens of *A. crataegi*, and which were described by Kaltenbach as a generation living specially on apple trees. According to Mordvilko *A. crataegi* migrates also to *Aethusa* (fool's parsley). The damage done by the form found on apple trees is very great. The author reared from the stem-mothers of *A. crataegi*, a parasite, identified by Kurdjumov (by whom all the other parasites mentioned were also identified) as *Ephedrus lacertosus*, Hal.

*Phorodon humuli* lives on thorn bushes, on *Prunus insiticia*, L. (bullace), and on plum trees, migrating to *Humulus lupulus*, L. (hops). At the same time the author found that some individuals pass the whole summer on plum trees. Those found during the summer on hops are exclusively wingless females, only the last generation, consisting of winged specimens, migrating back to the plum trees. These aphids do not visibly injure plum trees, but cause great damage to hops, being the most dangerous pest of these plants.

*Myzus cerasi* was found by the author during the whole summer, after 9th June, on cherries, there being practically no winged females. His observations did not confirm the statement by Kessler that these aphides migrate in the summer, although he is unable definitely to dispute this statement. The damage done by them to cherry trees is very great, when they appear in large numbers. The author found the following insect enemies : Larvae of a Chrysopid, of *Bremia* and of Syrphid flies ; imagos of *Coccinella bipunctata*, L. ; he found also empty skins of aphids, from which some parasite had emerged.

*Hyalopterus pruni*. The author confirms the discovery by Mordvilko that this is synonymous with *H. arundinis*, F., which is found in summer on reeds, to which they migrate from plum trees, returning to the latter in autumn. Some, however, do not migrate at all, so that from June to August they can be found on both the primary and intermediate host plants. Besides plum trees they are also found on apricots, peach trees, thorn-bushes (*Prunus spinosa*, L.) and on *Prunus insiticia*, L. The sucking of these aphids affects the leaves but little, but they assist the development of a fungus (*Capnodium salicinum*, Mont.), and cause considerable damage by attacking unripe fruits at the beginning of summer. These aphids were found to be destroyed by Syrphid larvae and by those of *Bremia* ; many specimens

were infected by *Praon flavinode*, Hal., out of some of which the author reared a hyperparasite, *Lygocerus* sp.

*Aphis prunorum*, sp. nov. These were identified by Mordvilko as a new and undescribed species, and the author gives descriptions of the winged and wingless parthenogenetic female, larvae, nymph, and sexual female. He found large colonies of these insects on a young green shoot of an apricot tree on the 6th June, consisting of wingless females, nymphae and young larvae; on the 9th July they were found, mostly as winged females, nymphae and larvae of all stages, on leaves of apricot trees; on the 22nd July only winged females and nymphae were found, and from the 29th July till the 9th September no specimens could be found on any plants; on the last date they were again observed on leaves of plum trees, where they were found until the 30th October. Evidently they migrate in the summer to some intermediate host plants.

*Aphis pruni.* The author found larvae and wingless females on young leaves of plum trees on 29th May, but by the end of July the insects had entirely disappeared from these trees, being found instead on *Cynoglossum officinale*, L. (dog's tongue) during July-August. But the author is satisfied that these two, *A. cardui*, L., and *A. pruni*, Koch, are synonymous, and that the latter form migrates in the summer to some intermediate host plants, returning in the autumn to plum. He further thinks that it is probable that the species described by Koch as *A. jacobaeae*, Schr., *A. symphyti*, Schr., *A. chrysanthemi*, Koch, and *A. carsellae*, Koch, are all synonymous with *Aphis cardui*, L. s. *pruni*, Koch. *A. pruni* also occurred on young shoots of apricot trees, as well as on *Prunus spinosa*, L.; a large proportion of those found on the latter plant were infected by the parasite, *Lysiphlebus* (*Aphidius*) *cardui*, Marsh.

*Rhopalosiphum ribis.* The author's observations again confirm those of Mordvilko, to the effect that this species migrates in the summer from its chief host plant, black currant, to various species of *Sonchus* (sow thistle). He found many enemies and parasites of these flies: they were devoured by larvae of ladybirds and of Syrphid flies and by bugs of the genus *Anthocoris*; he also reared the parasites *Praon volucre* Hal., and *Ephedrus lacertosus*, Hal.; from these parasitised specimens the hyperparasites, *Pachyneuron* sp. and *Lygocerus* sp., were also reared.

*Myzus ribicolus.* The author's attention was called to this species only in the autumn, when he found them on the 6th September on black currant; he failed to distinguish them in the spring, owing to their similarity to *Rhopalosiphum ribis*; they were not to be found on currants during the summer.

*Myzus ribis.* These were found during the whole summer and autumn on black and red currants. They do not harm black currants, but produce bright red protuberances on leaves of red currants. The author found that they were destroyed by larvae of one species of Syrphid, and by those of the *Bremia*; a considerable number were infected by *Lysiphlebus* (*Aphidius*) *ribis*, Hal.

*Aphis grossulariae.* According to the author these are the most injurious of all the currant aphides; he found them from the 23rd April to the end of October. The following enemies of these lice are reported: Syrphid larvae, larvae of *Bremia*, the beetles *Exochomus quadri-*

*pustulatus*, L., some predaceous bugs, and the parasite *Lysiphlebus cardui*, Marshall, var.; the latter playing an important part in the destruction of the insects.

*Schizoneura ulmi*. These lice were found in May on *Ulmus effusa*, Willd., and on *Ulmus montana*, With., in galls on the leaves; the second generation consisted of winged females, which migrated during June to the roots of red and black currants (*Sch. fodiens*, Buckt.). In September and October the winged sexes flew back to the chief host plants. The author states that they are distinctly injurious to currants when present in any numbers. The only remedy is to remove all elm trees from the orchards attacked, as they winter on elms, and cannot exist without them.

*Macrosiphum rubi*. This species was found in July, and afterwards during the whole summer and autumn on leaves of raspberry bushes, but always in small numbers. No damage by them was noticed.

*Aphis idaei*. Found on raspberry bushes in May and during June; they disappeared afterwards. The damage done by them to raspberries is great.

*Aphis mordvilkiana*, sp. nov. This new species was found by the author in September underneath leaves of raspberry bushes. He thinks it probable that the lice were there before, but were not distinguished by him from larvae of *Macrosiphum rubi*, Klt., which they resemble at first sight. They rested on the leaves singly, chiefly along the veins; underneath one leaf some dozens of specimens were found. All the specimens noticed were wingless females and their larvae; no winged females, nymphae, or males were found. On October 15th, the author found groups of eggs of this species on branches of raspberry bushes, near the buds. The majority of the eggs had already turned black, but freshly laid eggs, as well as ovipositing females were also found.

Parker (W. B.). **Flour paste as a control for red spiders and as a spreader for contact insecticides.**—*U.S. Dept. Agric. Bureau Entom., Washington, Circ.* no. 166, 30th Jan. 1913, 5 pp., 2 figs.

Flour paste is not only a suitable "spreader" for lime-sulphur solutions, but it apparently serves, to some extent, as an active insecticide. Each gallon of paste contains 1 lb. of flour, and the addition of four gallons of paste to 100 gallons of lime-sulphur causes the spray to adhere to the leaves as a thin film, increasing its efficiency almost threefold, mainly owing to the spreading effect of the paste. A series of trials was made with nicotin sulphate against the hop aphis (*Phorodon humuli*) in which flour paste at the rate of four gallons to 100 gallons of the nicotin sulphate solution at strengths of one in 2,000, and one in 3,000 was employed. In these trials from 99 to 100 per cent. of the aphides were destroyed. It was observed that many of the smaller aphides were pasted on to the leaves. Accordingly, flour paste without any other insecticide was tried, and when used at the rate of eight gallons (= 8 lb. flour) in 100 gallons of water or even stronger (say 10–100 or even 12–100) most of the young and tender aphides (97 per cent.) and of the red spiders (*Tetranychus bimaculatus*) were killed. No damage was done to the hop plants, even when in full

bloom. The older and stronger aphides, and the eggs of the red spider, were not killed by the flour paste. To deal with the latter, it was found necessary to make a second application, seven or ten days later, in order to reach the mites that emerge from the eggs. In a series of five experiments against red spiders on hops with flour paste at the rate of 8–100, it was found that from 99·8 to 100 per cent. were killed. This paste solution is exceedingly cheap. It has been used successfully against red spiders on beans, chrysanthemums, hops, cucumbers (in greenhouse and field), pumpkins, pears, prunes, roses (in field), and violets (in greenhouse and field). The chrysanthemum leaves may become spotted if spraying is done too near the time of blooming. Flour paste was not satisfactory when used upon greenhouse roses and carnations or field sweet peas. To prepare the flour paste, mix a cheap grade of wheat flour with cold water, making a thin batter, without lumps, or wash the flour through a wire sieve with cold running water and make up to one gallon of water to each 1 lb. of flour. With constant stirring to prevent burning and caking, cook until the paste is formed. It will be necessary to add sufficient water to balance loss by evaporation. Ineffective spray is due to insufficient cooking. When overcooked, the paste hardens when quite cold and cannot be easily mixed with water. Usually, overcooking is not disadvantageous. In the spray tank the paste tends to settle, and the solution must be agitated to ensure good results, but it shares this slight disadvantage with most materials. It is a most effective spreader for lime-sulphur and nicotin sulphate sprays, is easily obtainable, and has no odour like fish-oil soap. Used alone at a strength of 8–100, it is effective against several leaf-feeding mites and some very delicate aphides. From observations made during four months, it seems possible that flour paste may be useful as a spreader for lime-sulphur for scale-insects and fungi, and as a " sticker " for arsenicals.

**Prohibition of Removal of Certain Diseased Plants.**—*Proclamation of the Governor of South Australia, Adelaide,* 15th May 1913.

The Governor, with the Executive Council of South Australia, by virtue of the provisions of " The Vine, Fruit and Vegetable Protection Acts, 1885 and 1910," prohibit the removal of citrus trees or the fruit of citrus trees from any part of the State into a stated portion of the Murray Valley (25 miles on either side the river), and also declare that no citrus trees or fruit shall be removed between the areas described unless examined by an inspector and declared free from red scale (*Aspidiotus coccineus*), and all such trees or fruit must be despatched in *new* cases or packages. Such consignments on arrival at their destination are to be re-examined by an inspector before delivery to the consignee.

**Important Amendments to Codling-moth Regulations. Fruit Removal Regulations** (*Proclamation No.* 20 *of* 1913).—*Agric. Dept. of Union of S. Africa, Pretoria,* no. 16, 6th May 1913, 10 pp.

By Proclamation 20 of 1913, Proclamation No. 38, dated the 22nd February 1912, is superseded and repealed. The regulations applying to vines, grapes and mango trees are unaltered, while the change with

respect to apples, pears and quinces, is that of omitting a number of districts from the area of the Cape Province, into which the removal of these fruits has been prohibited for the past seven years. Care is necessary to avoid the removal of prohibited fruit into "protected" portions of the Union, and every wrongful removal is to be reported to the Magistrate of the district in which the offence occurred, and the consigner and consignee may both be punished. The protected areas are enumerated, and removals are not allowed from one protected area into another. The removal of boxes, etc., that have been used for the storage or conveyance of apples, pears, and quinces into areas into which the removal of these fruits is prohibited is illegal. The return into a protected area of boxes, etc., that have been used for the conveyance of any of the fruits named, to any place outside of that area is not allowed. It is also illegal to use second-hand apple-barrels, pear-boxes, etc., for the sending of any produce into a protected area. Travellers by train and cart would be violating the restrictions if they took any prohibited fruit into a protected area. The removal of the restricted articles through a protected area in direct transit by rail or post from a place outside of it to a place outside of it, is allowed. The object of the regulations is to check the spread of codling-moth into parts of the Union which are still supposed to be free from this pest, and which are considered generally suitable for the culture of apples or pears. The contraction of the protected Cape area was prompted by the presence of the pest in many places within the parts now omitted from the protected area. The presence of the pest, to a very small extent, is suspected in many places within the still protected areas, and as a check on its spread from sources within, the Government issued Notice 366 of 1912. The effectiveness of these various measures in retarding the spread of the codling moth will depend to a great extent on the alertness of parties within the protected regions in detecting and reporting any infringements. Besides repealing Proclamation No. 38 of 1912, Proclamation 20 of 1913 also announces certain restrictions as to the removal of grape vine, virginia creeper, ampelopsis or other plant of the natural order, Vitaceae, or any living portion (except seed), or fresh food of any such plant, and of any mango trees or any portion thereof (except the fruit), and of apple, pear or quince fruit in its fresh state. The areas protected and not protected in respect of these different fruits are set out, as also the various lines of railway along which the transit of the plants and fruit mentioned in the amendment, may or may not be carried.

Fuller (C.). **The Wattle Bagworm.**—*Agric. Jl. of Union of S. Africa, Pretoria*, vi, no. 2, Aug. 1913, pp. 198–217, 9 pl.

The present paper is a continuation of that which appeared in Vol. 5, No. 6 of the *Agricultural Journal of the Union of S. Africa* [see this *Review*, Ser. A, i, p. 303.] The life-history of the wattle bagworm (*Chalioides junodi*, Heylaerts) is given. The male moths begin to emerge, and the females become adult during July. In August egg-laying begins, and towards the middle of the month the young larvae appear. By September egg-laying is finished, the adult moths die off, and the main brood of young emerge from the maternal bags. In the

months from October to February the larvae feed and grow, the greatest damage being done from November to January. In March the larvae discontinue feeding and prepare to pupate, the males first, and later the females; pupation occurs during April, May and June. Although in the caterpillar stage no difference between male and female is evident, the pupae differ markedly. The adult female is a segmented spindle-shaped organism, bearing no resemblance to a moth, having neither wings nor legs. She never leaves her bag, and in this some 600 eggs are laid, in a mass of wax-like secretion mixed with scales.

Shortly after the eggs hatch, the young larva, instead of beginning at once to feed, drops from the base of the bag, supported by a gossamer strand, and sways about in the air, until it comes in contact with some object on a lower plane; it then ascends its strand again and remains upon it for a day or two, making no attempt to feed, however near food may be. The author suggests that this is a device to aid in the dispersal of the species; birds flying through plantations would be apt to pick up on their beaks, feet or feathers, the glutinous gossamer threads to which the insects are attached, and the insects would thus be deposited in another locality. This habit of the larvae may account for their spread by the wind, which would transport the leaves to which the threads are attached.

WARREN (E.). **On the Economic Value of Wild Birds.**—*Agric. Jl. of S. Africa, Pretoria,* vi, no. 3, Sept. 1913, pp. 461–465.

The author points out the immense value of birds as destroyers of injurious insects, ticks, etc., and contends that the benefits they confer upon the stock-farmer and agriculturist, far outweigh the relatively small amount of damage they may do, except in the case of a few species. He then mentions a number of useful South African birds, giving a general indication of the nature of their food. It is pointed out that in many parts of South Africa the lack of cover and widespread grass fires are very prejudicial to bird-life; and farmers are urged to pay some attention to the needs of birds. Strips of bush should be reserved as cover, and in open country trees should be planted in the vicinity of cultivated lands, so as to furnish suitable breeding places; for it is when birds are feeding their young that they are specially active in destroying insects.

LOUNSBURY (C. P.). **Pernicious Scale.**—*Agric. Jl. of S. Africa, Pretoria,* no. 4, Oct. 1913, vi, pp. 662–670.

It is now a little more than two years ago that Pernicious (San José) Scale, which has the reputation of being the most serious of all the numerous scale pests of deciduous fruit trees anywhere in the world, was discovered to be present in South Africa. The Government at first decided to attempt the eradication of the new pest by burning infested trees and plants. Owing to the immensity and cost of the undertaking, the Government, in April 1912, decided to leave the eradication or suppression of the pest on any particular property to the enterprise of the occupier or owner. The dissemination of the pest was due wholly, or in large part, to purchases of trees from one

nursery at Pretoria and one at Pietermaritzburg, and had been going on at least since 1906. The response of the occupiers to the appeal for suppressive action was, on the whole, gratifying, but many took no action at all, and others sprayed to little effect, probably owing to slovenly application. Lime-sulphur wash and "Scalecide" have both proved highly efficient as spraying fluids. One thorough spraying every winter is evidently all that is required to prevent damage to a tree; but two or three thorough sprayings in one winter may be necessary to get the pest well under control in the case of trees which have been allowed to become badly infested by neglect in one or more years. The measures that the Government is applying to prevent the rapid dissemination of the insect are chiefly those relative to nurseries and plant traffic, intended to check the spread of plant pests in general. Special instructions were given to railway and postal officials, who send non-certificated plants to an Agricultural Department plant-inspector for examination before they are forwarded for delivery. Special legislation applies to Pretoria, it being illegal to remove any plants from the town without the written permission of the Department of Agriculture. It is also illegal to remove any woody plants from a property known to be infested with the insect anywhere in the country. A general inspection was made between August 1911 and April 1912, and the towns and places where the pest was found are given, and in a general way, the position in July 1913. The towns and places inspected are in the Transvaal, Orange Free State and Natal.

Martelli (G.). **La lotta naturale contro il Crisomfalo (Bianca-rossa), gli Afidi (Formichedda), la Mosca (Verme) delle arance, delle pesche ecc. e la Mosca (Verme) delle olive.** [Use of natural enemies against *Chrysomphalus*, Aphididae, the Mediterranean Fruit Fly and the Olive Fly.]—*Giorn. Agric. Meridionale, Messina*, vi, nos. 8–9, Aug.–Sept. 1913, pp. 137–142.

The successful introduction of *Novius cardinalis* against *Icerya purchasi*, Mask., in the province of Messina and elsewhere, and the possibility of obtaining good results with parasites of other injurious insects led the Cattedra ambulante d'Agricoltura in Messina to introduce as many of such enemies as possible. It is due to F. Silvestri that the Coccinellids, *Rhizobius lophantae*, *R. ventralis* and *Orcus chalybaeus*, which prey upon *Chrysomphalus* and other injurious Coccids, and *Hippodamia convergens*, an enemy of aphids, have been imported. He also brought two other parasites: *Galesus silvestrii*, Kief. and *Dirhinus giffardii*, Silv., into Italy to combat the Mediterranean fruit fly, and then found that they would breed in the olive fly. It is therefore hoped that these parasites will be efficient against both these pests in peach, orange, and olive-growing districts where the soil is loose and sandy. As yet it is not known whether the parasites will become acclimatised, but from the Naples district, where some of them were introduced some time ago, the reports are most satisfactory.

Ballou (H. A.). **Report on the prevalence of some Pests and Diseases in the West Indies during 1912.**—*West. Ind. Bull., Barbados*, xiii, no. 4, 22nd Sept. 1913, pp. 333–357.

The information presented in this report covers most of the

agricultural pests and diseases in the West Indies. An easy form of reference is provided by tables showing the observations of their occurrence and non-occurrence. The insect pests referred to are as follows :—

Cacao pests :—Thrips (*Heliothrips rubrocinctus*, Giard), noticed in Grenada, St. Vincent, St. Lucia, Dominica, St. Kitts ; cacao beetle (*Stirastoma depressum*, L.), in Grenada ; scale-insects and mealy bugs in Grenada, Dominica, St. Kitts, Virgin Islands ; the greengrass bug (*Nezara viridula*, L.), in Grenada ; Aphis in Nevis.

Coconut pests :—Weevil (*Rhynchophorus palmarum*, L.) and white fly (*Aleyrodicus cocois*, Curtis), in St. Vincent ; coconut snow scale (*Diaspis boisduvali*, Sign.), glassy star scale (*Vinsonia stellifera*, Westw.), Bourbon aspidiotus (*Aspidiotus destructor*). coconut mealy bug (*Pseudococcus nipae*, Mask.), and green scale (*Coccus viridis*, Green) in Grenada, St. Vincent, St. Lucia, Antigua, St. Kitts, Nevis, Virgin Islands ; termites in Nevis.

Indian corn pests :—Corn ear worms (*Chloridea obsoleta*, F., and *Laphygma frugiperda*, S. and A.), in St. Vincent, Antigua, St. Kitts, Nevis, Virgin Islands ; hard-back grubs (*Lachnosterna*), in Antigua. The ripening heads of guinea-corn were attacked by caterpillars (not described) in Montserrat.

Cotton pests :—The cotton worm (*Alabama argillacea*, Hb.), noticed in St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands ; the boll worm (*Chloridea obsoleta*, F.) and *Laphygma frugiperda*, S. and A., in Antigua ; the cotton stainers (*Dysdercus andreae*, L., and *D. delauneyi*, Leth.), in Grenada, St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands. Scale-insects (*Saissetia nigra*, Nietn., and *Hemichionaspis minor*, Mask.), in Grenada, St. Vincent, Antigua, Nevis, Virgin Islands ; the flower-bud maggot (*Contarinia gossypii*, Felt), in Montserrat and Antigua ; the leaf-blister mite (*Eriophyes gossypii*, Banks), in St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands ; a hard-back beetle (*Cyclocephala dimidiata*) in Grenada ; a small bronze beetle and a bug (*Edessa meditabunda*), in St. Vincent ; cotton aphis (*Aphis gossypii*, Glover), in Montserrat, Antigua and Nevis.

Pests of green dressings :—Pigeon peas were attacked by the beetles *Bruchus chinensis* and *B. quadrimaculatus*, in Dominica ; a caterpillar (known locally as the Bengal bean worm) attacked horse beans in Montserrat and cowpeas in Antigua ; a weevil (*Exophthalmus esuriens*, Boh.) was found on pigeon peas in Antigua, where Barbuda beans were infested by an aphis.

Pests of limes and other citrus trees :—Scale-insects, especially *Coccus viridis*, Green, are still doing much damage in St. Vincent ; all the commoner kinds occurred in St. Lucia, the green scale (*C. viridis*) and the snow scale (*Chionaspis citri*, Comst.) being the most troublesome. One or two outbreaks of scale-insects were reported from Dominica ; the purple scale (*Lepidosaphes beckii*, Newm.) and the green scale were noticed in Montserrat, where for the first time limes were seriously attacked by the West Indian red scale (*Chrysomphalus aurantii*, Mask.). The lantana bug (*Orthezia insignis*, Douglas) is very scarce in Montserrat ; scales were common in Antigua ; they are abundant wherever there are lime trees in St. Kitts ; green, purple and snow scales occurred in Nevis ; white scale and purple scale in

the Virgin Islands. The bark-borer (*Leptostylus praemorsus*, F.) was noticed in St. Lucia; the twig-borer (*Elaphidion mite*, Newm.), in Antigua; the fruit fly (*Ceratitis capitata*, Wied.), in Dominica.

Sugar-cane pests:—The moth borer (*Diatraea saccharalis*, F.) noticed in Grenada, St. Lucia, Antigua, St. Kitts, Nevis; the weevil-borer (*Metamasius sericeus*, Oliv.), in St. Lucia, Antigua, St. Kitts; the root-borer (? *Exophthalmus esuriens*), in St. Lucia, St. Kitts; termites in St. Kitts; hard-back grubs (*Lachnosterna* spp.), in Antigua, St. Kitts, Virgin Islands.

Sweet potato pests:—Horn-worms (*Protoparce cingulata*, F.), in Antigua and Virgin Islands; the scarabee (*Cryptorhynchus batatae*, Waterh.), in Grenada and St. Kitts; the red spider (*Tetranychus telarius*, L.), in St. Lucia, Antigua, and Nevis; a white fly (species unknown), in Grenada.

Yam pests:—The yam scale (*Aspidiotus hartii*), in Grenada; the scale that occurs on the stored tubers was observed in St. Kitts.

It is stated that the canes on one estate—the locality of which is not given—were infested with shot-borer, wherever the attacks of rind fungus, and other fungus diseases occurred severely. Grasshoppers are a great pest in many districts, especially in dry localities, and flocks of guinea-fowl are successfully kept for the purpose of controlling them.

Regarding parasites of injurious insects, it is stated that *Cephalosporium* fungus has done good work on the mango shield-scale in Grenada, and *Sphaerostilbe* has increased rapidly in the St. David's district, Grenada. In St. Vincent and St. Kitts, *Chalcis* sp. and the Jack Spaniard wasp (*Polistes annularis*) control the cotton worm to a noticeable extent, and planters are encouraging the wasps by erecting rough shelters for them in or near the cotton fields. The white-headed, black-headed, and red-headed fungi parasitised the scales on lime trees in St. Lucia, and, although not so general, the buff shield-scale fungus was well established in some districts. In Antigua, parasitic fungi on scale-insects are much more common than was realised some time ago. Lady-birds are increasing on some lime plantations.

MacDougall (R. S.). **The Large Narcissus Bulb Fly** (*Merodon equestris*, Fab.)—*Jl. Board Agric., London*, xx, no. 7, Oct. 1913, pp. 594–599, 2 figs.

The narcissus fly, first recorded in England in 1869, is responsible for a great destruction of narcissus bulbs in different parts of the country. In addition to bulbs of the genus Narcissus, the larva has been found in bulbs of Amaryllis (Adams), Habranthus (Chittenden), Vallota (Chittenden and Theobald), Eurycles (McLachlan), Lilies (Wilks), and Galtonia (Theobald). Theobald found the larvae at work (at Wye and in Devon) in the bulbs of the Wild Hyacinth (*Scilla nutans*), and, partly on this, bases his opinion that *Merodon equestris* is native to England. The larvae tunnels and feeds in the bulb, which may be so spoiled that it rots away completely. In other cases flowers and weakened plants may be produced, but no new bulbs. It is often difficult to say without opening the bulb that a *Merodon* grub is present within, but in typical cases the infestation can be recognised by the bulb "giving" on being squeezed between the finger and thumb.

Treatment :—(1) Failing bulbs and plants should be removed from the beds and destroyed ; (2) destruction of all decayed and infested bulbs at the time of lifting and also, especially in case of importation, before planting ; in daffodil-growing grounds, where some years ago *Merodon* was proving a great pest, the persistent examination for, and destruction of, sickly bulbs has resulted in its being the rarest occurrence now to find a *Merodon* ; (3) sifting the surface layers of the soil, where this is practicable, for pupae ; in Holland the surface layers are searched about the time that the plants are coming into flower ; (4) steeping the bulbs in water for from two to eight days, in order to drive out and drown the larvae ; a number of experiments show that while good results may follow, there are failures also ; (5) catching the flies with hand-nets ; this is a valuable measure.

Theobald, in his second British Museum Report (1904), recorded the finding in bulbs of narcissus of another Syrphid larva, which proved to be *Eumerus strigatus*, Fall. It infests onions, shalots and the bulbs of the hyacinth, either alone or along with *Merodon*. A number of *Eumerus* larvae may be present in a single bulb. Infested bulbs become discoloured, and rot away. The author has found numbers of *Sciara* larvae in bulbs of Glory of Leiden and Duchess of Westminster, and has at different times bred species of several genera of MYCETOPHILIDAE from decaying bulbs.

PICARD (F.). **Le *Cleonus mendicus* et le *Lixus scabricollis*, Charançons nuisibles à la Betterave dans le midi de la France.** [*Cleonus* (*Temnorrhinus*) *mendicus* and *Lixus scabricollis*, Weevil Pests of Beetroot in the South of France.]—*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux,* xii, no. 5, Oct. 1913, pp. 129–137, 1 pl.

Though not so largely grown as in the North of France, beetroot is also cultivated in the Mediterranean region, where its pests are generally of species different from those found in the northern provinces. Though the black aphis (*Aphis euonymi*, F.), and the beet fly (*Pegomia hyoscyami*, Meig.) occur nearly everywhere, the flea-beetle (*Chaetocnema tibialis*, Illig.) and the beet moth (*Phthorimaea ocellatella*, Boyd) become commoner as one advances southwards. The weevils, *Temnorrhinus mendicus*, Gyl., *Bothynoderes punctiventris*, Germ., and *Lixus scabricollis*, Boh., are exclusively southern species. Valéry Mayet has studied *T. mendicus* thoroughly, but *Lixus scabricollis* and its habits are nearly unknown. After emerging in autumn the adult *Temnorrhinus* passes the winter underground and appears in April or May. The date of its appearance depends solely on climatic conditions, and thus all the beet fields are invaded simultaneously. If alternate crops are grown the weevils travel immediately to the new ground, guided apparently by their sense of smell. The eggs are laid in the ground near the collar of the plants, and by the end of May almost every adult is dead. Because of its earthy colour and its habit of remaining under clods or close to the plant the insect is not always noticed by cultivators, and even a severe infestation can only be detected by a careful examination. On hatching, the larva tunnels the surface of the young root. Later on the hole is increased in size, but is not made deeper. The work tends downwards, and only the

underground portion of the root is attacked. At the end of September many larvae are still present in the roots, but pupae and some adults also are to be found. The latter either remain in the pupal chamber or emerge into the open. On warm sunny days they may be seen feeding on the leaves. Collectors consider *T. mendicus* to be rare, but it fairly overruns the beet-fields of the Agricultural School at Montpellier in Hérault. In 1913 all the roots there had been attacked. The necessity for a mild climate and compact clay soil limits its spread, for beetroot can only be successfully grown in a loose deep soil. Wherever *Temnorrhinus* finds its favourite plant under the above conditions, it speedily develops into a terrible pest. In Russia and Hungary *B. punctiventris* and *B. betavorus*, Chev., are only too well known. The former is also a southern species, but is rare in Hérault, as it requires a sandy soil. Many Cleonids living on Salsolaceae will attack beetroot. Thus *Temnorrhinus brevirostris*, Gyl., is a species found on the Mediterranean coast on Kelp (*Salsola*) and on *Atriplex*. So far it has not been found on beetroot, but *Chromoderus fasciatus*, Müll., (*albidus*, F.), which is common on *Atriplex*, *Chenopodium*, *Salsola*, etc., has been reported as a beet pest in Central Europe. Though very abundant in Hérault, the author has not observed it in the beet-fields there. As regards *Cleonus piger*, Scop. (*sulcirostris*, L.) most writers notice it as a beet pest, but one of little importance. Indeed the author believes it not to be such. *Temnorrhinus* has few enemies; no Hymenopterous parasite is known, but Sphegids of the genus *Cerceris* prey on it, though not to any great extent. In pursuing his investigations on *Cocobacilli* as insect parasites the author found one of these bacteria in the larvae of *T. mendicus*, which he provisionally named *Bacillus cleoni*. It remains to be seen whether it differs specifically from *Bacillus cajae* discovered in *Arctia caja* by G. R. Blanc and the author.

When the larvae have penetrated into the root the damage is past remedy. The adults must be destroyed when feeding, prior to oviposition. Valéry Mayet recommended arsenicals, and especially a solution of 5 oz. sodium arsenite in 20 gals. of water, to which 2 lb. of flour had been added to make it adhere. The ordinary arsenate of lead sprays may be used also. Spraying must be done before oviposition takes place, and beetroot sprayed in April can be fed to cattle in October without any danger whatever.

*Lixus scabricollis*, Boh., is practically of no economic importance. It is parasitised by a Braconid of a species as yet unknown, but which the author will describe shortly. *L. ascanii*, L., and *L. junci*, Dahl., have long been known as beet-feeders, but they also seem of little importance. They are sometimes found on spinach.

FEYTAUD (J.). **Les Hémérobes ou Chrysopes** [*Chrysopa*.]—*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xii, no. 5, Oct. 1913, pp. 138–148, 3 figs.

The *Chrysopa* most common in France are *C. vulgaris*, Schn., *C. perla*, L., *C. septempunctata*, Wesm., and *C. aspersa*, Wesm. *C. vulgaris*, which may be taken as a type, is pre-eminently carnivorous. Already known as a destroyer of Aphids, the perfect insect has been also observed killing the caterpillars of *Polychrosis botrana*. The egg is

attached to a stem about 6 or 7 mm. long, which the female produces prior to laying. The larva is very agile and even more voracious than the adult. *Chrysopa* are mostly known as enemies of aphids, but according to Schneider they also prey on the larvae of Muscidae and Coleoptera. In the vineyards, *Chrysopa* also attacks *Phylloxera* in its stages above ground, and here again the larva is the chief destroyer. Fuschini has calculated that one larva can devour about 6,000 eggs, besides causing the indirect destruction of those contained in the ovaries of the female. The larvae of *Nephopteryx divisella*, Dp., and *Hylotoma rosae*, F., also fall a prey to *Chrysopa*. *C. vulgaris* has been described as an enemy of the Vine Tortrix ("Pyrale" de la vigne) (*Oenophthira pilleriana*, Schiff.) In 1911, the author reported an abundance of *Chrysopa* in the south-eastern vineyards, which had been invaded by the Microlepidoptera of the vine, and showed clearly that *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., were destroyed by *Chrysopa* larvae, and even by the adults. Experiments conducted in 1913 showed that a single larva could eat about 60 *P. lychrosis* caterpillars, at the rate of 3 or 4 a day. The agriculturist should therefore learn to know and protect so helpful an auxiliary. The author very strongly recommends that all traps baited for the moths of *Polychrosis* be emptied and cleaned immediately they cease to be useful, as *Chrysopa* are also taken in them. Indeed it has been found that they capture *Chrysopa* more often and in larger numbers than *Polychrosis*, thus doing a great deal of harm. Birds, especially night-birds, and bats are great enemies of the perfect insect, and Syrphid larvae have been seen to destroy *Chrysopa* larvae. *Hemiteles aestivalis*, Gr., *Helorus anomalipes* Pz., and *Microgaster perlae*, are all parasites of *Chrysopa* larvae, and *Telenomus acrobates*, Giard, parasitises their eggs. A bibliography of 18 works completes the paper.

**Cacoecia costana.**—*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xii, no. 5, Oct. 1913, pp. 156–157.

In an editorial note mention is made of the occasional ravages of *Tortrix* (*Cacoecia*) *costana* in vineyards. Henri Kehrig (*Feuille vinicole de la Gironde*, 22nd May 1890, and *Bull. Soc. de Zoologie Agric.*, Dec. 1911), Dr. Schwangart (*Mitt. d. deutschen Weinbau-Verein*, June 1911), and F. Picard (*Progres Agricole*, 5th May 1912), have reported this pest in the Gironde, the Palatinate, and in Camargue.

**Quarantine Regulations on Shipment into Georgia of Articles from Territory Infested with Mexican Cotton Boll Weevil.**—*Georgia State Bd. Entom., Atlanta, Circ.* no. 13, Oct. 1913.

At a recent meeting of the State Board of Entomology, the following regulations were adopted concerning shipments from sections of the country infested with Mexican cotton boll weevil. Restrictions were placed on the following articles when originating in infested areas:—(1) Seed cotton; (2) cotton seed; (3) seed cotton sacks, cotton seed sacks, cotton pickers' sacks which have been used within eight months; (4) cotton seed hulls, between 1st Aug. and 30th Dec.;

(5) Spanish moss and corn in shuck, or shucks removed from corn, between 1st Oct. and 30th June; (6) household goods containing any of the foregoing articles, during the period of quarantine applying to each; (7) living weevils in the possession of any person outside of the infested territory, except a qualified entomologist. Under certain conditions restricted articles can be shipped from uninfested sections of States in which boll weevil occurs.

No restrictions were placed on the following articles:—(1) Bales of cotton, flat or compressed, with no restrictions as to season; (2) linters and loose cotton lint; (3) cotton seed meal, cake and oil; (4) corn, shelled or shucked, or with shucks removed, oats or any other seed except cotton seed; (5) cotton seed shown by affidavit to have been sacked continuously for nine months or more; (6) cotton seed for planting purposes only, after fumigating with carbon bisulphide by competent entomologist; (7) hay; (8) empty freight cars.

VAYSSIÈRE (P.). **Cochenilles nouvelles de l'Afrique française** [New Coccids from French Africa.]—*Rev. Phytopath. appliquée, Paris*, i, no. 9, 5th Oct. 1913, p. 124.

A short description is given of *Mytilaspis coccomytibus dispar*, ssp. nov. and *Diaspis taxicola*, sp. nov. The former was found in large numbers on a branch of manioc in Madagascar, while the latter was collected on *Taxus baccata* in the Atlas of Blidah (Algeria).

CHITTENDEN (F. H.). **The Florida Fern Caterpillar.**—*U.S. Dept. Agric., Bur. Entom. Washington, Bull.* 125, 29th Oct. 1913, 11 pp., 1 fig.

The fern caterpillar, *Eriopus floridensis*, is a native of Florida and tropical America, but is extending north, causing damage in greenhouses in Columbia, Illinois, and Ohio. It has also been reported in Mexico, Guatemala, Costa Rica, the Bahamas, Jamaica, Cuba, Haiti, St. Lucia, St. Vincent, Venezuela, British Guiana, Brazil, and Trinidad. It is restricted to ferns, and appears to destroy more than it requires for food, cutting plants entirely bare and attacking each new leaf as it appears. Though not strictly a nocturnal feeder, it shuns bright light, and is most often found feeding exposed in early morning. Treatment of this pest is not easy. In one case a spray of a strong decoction of hellebore was used; this scalded the foliage, causing many plants to die. A bait of poisoned bran and molasses was tried, but the caterpillars preferred the ferns. Fumigation with carbon bisulphide was of no avail. Lead arsenate when used in a solution strong enough to kill the caterpillars is said to leave a white deposit, which destroys the commercial value of the fern. A spray of Paris green, strong enough to kill the caterpillars, burns the foliage. Paris green properly mixed with Bordeaux mixture should not produce this effect. Hydrocyanic-acid gas fumigation is also suggested for use when the eggs are hatching and during moults. It seems that hand-picking, though laborious, is most successful, one of the best methods consisting in shaking the plants over the ground and trampling on the caterpillars as they fall. *Ichneumon extrematis*, Cress., *Sagaritis* sp., and a Tachinid fly have been observed attacking this caterpillar.

Parker (W.). **A sealed Paper Carton to protect Cereals from insect attack.**—*U.S. Dept. Agric., Washington, Bull.* 15, 16th Oct. 1913, 8 pp. 8 figs.

The injury done by insects to packed cereals causes a financial loss much greater than most millers suppose. Examination of infested packages showed that infestation usually commenced where there was a hole in the package; carefully sealed packages appeared intact. The more important insects attacking stored cereal products are the Indian-meal moth (*Plodia interpunctella*, Hübn), the Mediterranean flour moth (*Ephestia kuehniella*, Zell.), the meal snout-moth (*Pyralis farinalis*, L.), the saw-toothed grain beetle (*Silvanus surinamensis*, L.), the confused flour beetle (*Tribolium confusum*, Duv.), the granary weevil (*Calandra granaria*, L.), and the rice weevil (*C. oryzae*, L.). The cereal is sterilised prior to being packed, and when insects are found in packages, the eggs, larvae, or adults have gained access to the cereal after, or shortly before, the cereal was packed. In an experiment to test the efficiency of a cheap sealed carton, a cereal was sterilised and placed in sterilised packages. Had any insects or eggs been in the packet, the temperature of 180° F. used for sterilisation of the cereal would, undoubtedly, have killed them. The packages were closed by glueing the ends, but some were covered with label paper, so that there were no openings. Some labelled and some unlabelled packages were placed in boxes with flour badly infested by the confused flour beetle. Tables of the results of the experiment show the label to be efficient in preventing insects entering the cartons. Infestation may take place in the cereal elevator leading from the steriliser to the packing room or in the grocer's storeroom. In drying non-flaky cereals a sterile chute with baffles, through which hot dry air is blown, would be effective. In the case of flaky cereals, a belt-elevator is necessary, but this can be inclosed and the hot air used as before. Both elevators should be so constructed, that they can be readily sterilised with air at a temperature above 180° F. The sealed carton may be made of a stiff cardboard. The printed label should be of three pieces, two ends which lap over the edges and extend down the side, and a side piece. Care must be taken to seal the ends of the carton properly before applying the label. Another package has been suggested, namely, the placing of a sealed paper bag inside an ordinary carton. This has proved to be no better than the old-style packages. In a large flour mill in California, 160 lb. steam is used as a source of heat, and a carrier eight feet long, with its load of cereal, can be heated to 180° F. in two minutes, by this means, without difficulty.

Chittenden (F. H.). **The Rose Slug-Caterpillar.**—*U.S. Dept. Agric., Bur. Entom., Washington, Bull.* 124, 31st Oct. 1913, 9 pp. 1 fig.

It is only within comparatively recent years that the slug-like caterpillar, *Euclea indetermina*, Boisd., has been known to injure the rose, though the larvae appear to have been known since 1797. Synonyms of *E. indetermina* are *Callochroa viridis*, Reak., *C. vernata*, Pack., and *Parsa chloris*, Grote. It is not a common species, and as it is of interest to rose-growers and to nurserymen, the author gives illustrations and a brief description of it. The larva has been observed

on *Rosa* spp., *Prunus* spp., *Quercus* spp., *Castanea dentata*, *Carya* spp., *Asimina triloba*, *Myrica cerifera*, *Cornus florida*, plum, apple and pear. It feeds on the edges of the leaves. The eggs, which are deposited on the underside of the leaf, hatch after about nine days. The larvae mature about the middle of September, passing through eight or nine stages, and have stinging spines. If only a few rose-bushes or young trees are attacked, handpicking will control this insect, precaution being taken to use a glove. A spray of Paris green or arsenate of lead may be applied.

Huard (V. A.). **Rapport de l'entomologiste du Ministère de l'Agriculture de la Province de Quebec pour l'année 1912-13.** [Report of the Entomologist of the Ministry of Agriculture of the Province of Quebec for the year 1912-1913.]—*Quebec*, 24th Oct. 1913, 15 pp., 5 figs.

The tent-caterpillars were the most important pests of the year. *Malacosoma americana*, F., chiefly attacks orchards and *M. disstria*, Hb., forests. The larvae of both soon strip a tree of its leaves. While it is evidently impracticable to prevent this destruction in the case of forest trees, damage in orchards can be almost entirely prevented. The eggs are easily seen on the bare branches in winter, and nearly all may be collected and burnt. Speaking generally, all insectivorous birds should be protected. The services of a sparrow are valued at 12 shillings a year in France, and must be worth more in the Province of Quebec. Banding is useful. Where the caterpillars emerge in the tent they may be taken and burnt, or a petrol torch may be used. Spraying the infested parts will destroy those caterpillars which have just hatched out. The spray is made up of 1 lb. Paris green in 160 gals. water, or 2 lb. arsenate of lead in 40 gals. of water.

In 1913 the San José Scale was observed for the first time in the Province on a young service tree, which was destroyed without delay. The woolly aphis *Eriosoma* (*Schizoneura*) *lanigerum* was observed in three places, but only a few trees were infested and instructions were given for the affected branches to be burnt. In a garden at Montcalmville, near Quebec, the Oyster-Shell Bark-Louse (*Mytilaspis pomorum*) was observed. The New York Plum Scale (*Lecanium prunastri*) was reported to be present in orchards of the county of Islet. In conclusion, the author suggests provincial legislation on three points: (1) To require an annual inspection by the Entomological Bureau of the Ministry of Agriculture of all those nurseries in the Province which deal in plants and fruits; (2) to give the inspector power to destroy plants infested by dangerous diseases or to order suitable treatment; (3) to forbid nurserymen to distribute their products unless they hold the current year's certificate from the Entomologist certifying that their nurseries are free from parasitic disease or insect pests.

King (H. H.). **On the use of Poison in the Control of Locusts in the Anglo-Egyptian Sudan.**—*Cairo Scientific Jl., Alexandria*, vii, no. 86, Nov. 1913, pp. 251-254.

The species of migratory locust most common in the Anglo-Egyptian Sudan is *Acridium* (*Schistocerca*) *peregrinum*, Oliv. The young locusts

appear after rain, and feed during the morning and evening. The methods of controlling locusts which have been adopted in the Sudan include the following: (1) Collection and destruction of eggs and hoppers; these methods need a large amount of labour and the collecting of eggs may be exceedingly arduous; (2) scaring away of adults by noises; (3) the use of bacteria, as *Coccobacillus acridiorum*, d'Herelle, and the locust fungus, *Empusa grylli*; these have proved of little help in the control of locusts.

During 1907, the author tested various other methods, among them poisoned bait. This bait consisted of fresh, green grass, finely chopped and soaked in a solution of 1 lb. arsenite of soda and 4–11 lb. treacle in 12 gallons water. This bait was scattered thinly either in front of the swarm while it was moving and feeding or under the shrubs in which the hoppers were roosting. The bait was readily devoured when the treacle was present in the proportion of 4 lb. to 12 gallons of water, but the hoppers were attracted still more when the proportion of the treacle was increased. A swarm fed with poisoned bait at about 7 a.m. would all be dead the following morning. Animals were not allowed to graze over the area treated for six days. The use of arsenite of soda in the control of locusts saves an enormous amount of labour, and the entire swarm is destroyed. The risk to cattle and other grazing animals, with ordinary precautions, is infinitesimal.

KERSHAW (J. C.). **Recommendations for dealing with the Froghopper.**—*Dept. Agric. Trinidad and Tabago, Special Circ.* no. 9, 1st Dec. 1913, 10 pp.

Under artificial conditions the vermilion egg-parasite, *Oligosita giraulti*, Cwf., parasitised 5 to 6 per cent. of froghopper eggs. After careful examination the author concludes that in nature the percentage is between 5 and 10 per cent. in the most favourable localities, with an average below 5 per cent. This parasite is, therefore, not worth consideration, and former recommendations for dealing with trash with regard to it are cancelled.

The Syrphid fly [*Salpingogaster nigra*, Schiner] is the chief check on the multiplication of the froghopper in Trinidad. Unfortunately, it usually appears in numbers only on the later broods. Its larvae are very voracious, and in most localities nymphs are scarce after the wet season, and the Syrphid larvae will probably either starve or destroy one another. Many female froghopper adults escape all enemies, and produce the early broods in the ensuing season, when there are but few Syrphids about. The author thinks it would be well worth trying to breed the Syrphid on through the dry season, in order to have a supply ready to distribute on any well-marked early broods of froghoppers. About 300 nymphs per day are required to feed 100 Syrphid larvae, but nymphs of *Tomaspis pubescens* can be procured in the dry season, and a supply of the Syrphid could be kept up in a large cage or enclosure, preferably erected over a channel or drain with suitable grass already growing there. A light rough construction would serve the purpose. The Syrphid will copulate and breed in a large and suitable cage. Then a few adult Syrphids and a few maggots could be liberated on early froghopper broods, wherever they occurred in numbers.

The author is not in favour of destroying the nymphs by ramming, but highly approves of early broods being collected by hand. The crushing of adults of early broods in young cane by squeezing the leaf sheaths where they congregate is also recommended. Possibly this plan would be even more effective than using the kerosene-lysol emulsion, but every efficient method should be used against the early broods, because it is impossible to do much against the enormous later ones. All abandoned land and grass fields near cane should be grazed or put under cover crops. The cattle disturb the froghopper so much, that it avoids these fields. Cutting the grass is useless. Regarding cane-trash, the author now thinks it probable that (where trash cannot be removed to the cattle pens) the best plan would be to keep it in a few large piles (boucans), rather than long beds between the rows of cane, provided that these boucans could be turned right over, and the nymphs below destroyed. As regards the destruction of adult frog-hoppers, trap lights are about the only method at present of any value at all, when the insects appear in great swarms. The following catches were made on badly "blighted" fields during September 1913: Night of 5th September, 24 lamps, 56,900 froghoppers; 10th September, 12 lamps, 23,420; 21st September, 72 lamps, 58,363. These were only the largest of many catches at lights. The hurricane lamps were placed about 20 to 25 feet apart, *i.e.*, one opposite the end of each cane bed along the trace, and stood in trays about 2 feet square, with a ledge to retain the water and film of kerosene, or a mess of molasses. They should also be placed where there is any open space among the canes.

Summarised briefly, the author's recommendations are:—(1) That a search be made for an efficient egg- or adult-parasite of the frog-hopper, though it is very unlikely that any will be procured in islands near Trinidad, or any adjacent part of the mainland; (2) that meanwhile every effort should be made to get the Syrphid on the early broods of froghopper; (3) abandoned lands adjacent to cane-fields to be either put under a cover crop or grazed; grass "traces" to be hoed and the rubbish taken to the cattle pens, especially just before the wet season; (4) all trash should be removed to the pens, and not returned to the fields till well broken up and sodden, and especially the trash of the two or three rows of cane nearest to traces or grass land just before the wet season; (5) after the appearance of early broods of froghopper nymphs they should be destroyed by kerosene-lysol emulsion or by squeezing the leaf-sheaths, whichever proves the quicker and more effective; (6) the later large swarms of adults should be destroyed as far as possible by trap-lights.

A grasshopper (*Xiphidium* sp.) is very common in grass lands, and destroys froghoppers along with other insects. It is considered to be *X. varipenne*. Next to the Syrphid, however, the author holds spiders to be the most effective natural enemies of the froghopper.

GUPPY (P. L.). **Life-history of the Syrphid fly predaceous on Froghopper Nymphs.**—*Bull. Dept. Agric., Trinidad and Tobago*, xii, no. 75, Nov. 1913, pp. 159-161.

From 30 to 40 nymphs are killed and sucked during the life of a larva of this fly [*Salpingogaster nigra*, Schiner], which is from nine to

ten days' duration, and no doubt it destroys numbers of very small nymphs wherever these are abundant. In two instances adult frog-hoppers were found killed by the maggot, which had attacked them when they had just issued from the last nymphal instar and were too soft to escape from surrounding froth. Besides the nymphs of *Tomaspis saccharina* (the sugar-cane froghopper) it kills those of *T. pubescens* (the black froghopper). It travels from froth to froth fairly rapidly, and is able to follow the nymphs under the soil. The fly itself resembles very closely a small black wasp with some yellow markings on the thorax and abdomen. Even when the fly is settled, it continues to move its abdomen in and out, just as a wasp does. This fly is one of the most important enemies of the froghopper. It is hoped to breed it successfully on a large scale so as to get it started earlier in the season.

CIMATTI (V.). **Per la difesa dei nostri agrumi.** [The protection of our citrus fruits.]—*Rivista di Agricoltura, Parma*, xix, no. 49, 5th Dec. 1913, pp. 782-784.

In 1910, Italy sustained a loss of about £40,000,000 through insect pests. A most dangerous one, which threatens to spread among the citrus plants, is *Chrysomphalus dictyospermi* var. *pinnulifera* (bianca-rossa). Lime-sulphur is useful for its control, and some of the conclusions arrived at by Martelli after long and repeated experiments with this insecticide are : The purity of the lime is of prime importance. The lime must contain 90 per cent. of calcium oxide, and in the 10 per cent. of impurity the magnesium oxide must not exceed 5 per cent. The sulphur must be of a very high degree of purity (98 per cent.), and in almost impalpable powder.

The larvae of *Prays citri*, Mil. (tignuola, zagara) ruins the orange blossoms. The following spray formula is given : 20 gals. water, 22 lb. molasses, 22 lb. dregs of lime juice essence, and 2 gals. water in which $4\frac{1}{2}$ lb. of sodium arsenite have been dissolved. Spray in May, repeat 10 days later ; then apply again in June and repeat as before. Another pest of citrus plants, *Pseudococcus citri*, Risso, causes the white mould (muffa bianca or cutuneddu), which is nearly always accompanied by fumaggine. The following emulsion is suggested : 6 lb. soap (soft or hard), $1\frac{1}{2}$ pts. petroleum, 20 gals. water. It should be applied, as usual, in June.

CHITTENDEN (F. J.). **On Beans damaged by Beetles.**—*Jl. R. Hort. Soc., London*, xxxix, pt. 2, Dec. 1913, pp. 379-380.

In some seasons a considerable proportion of the seed of broad-beans offered for sale is found to be damaged by a boring beetle, *Bruchus rufimanus*, Boh., often wrongly called the bean weevil. The question arises whether the damaged seeds may be sown with a prospect of reaping a crop. As it would be manifestly unwise to sow the beetles as well as the seeds, it is recommended first of all to destroy the beetles in the seed by fumigating with carbon bisulphide (3 lb. to 1,000 cubic feet of space) for 48 hours. Experiments have shown that seeds thus treated have produced plants as strong and as healthy as those from

undamaged seeds. The beetle instinctively avoids the radicle and plumule when boring, confining its attention to the food-stuff stored in the cotyledon, and of this there is a store great enough to satisfy the plant after the ravages made by the beetle. The only danger is that if the weather be cold and the seed long in germinating, there is a possibility of decay setting in, for bacteria or fungi would have easy access through the wounded testa.

WÜNN (H.). **Im Unterelsass und in der angrenzenden Rheinpfalz festgestellte Cocciden.** [Coccids recorded from Lower Alsace and the adjoining Rhine Palatinate.]—*Zeit. wissen. Insektenbiol., Berlin,* ix, nos. 8-9, 1st Sept. 1913, pp. 255-258.

This is a list of all the species of COCCIDAE, known from the area indicated, and with each species is given a very full record of the localities in which it has been found, and all the plants on which it has occurred. The list is being published in instalments.

**The Fertilisation of Cacao.**—*Gardens Bulletin, Straits Settlement, Singapore,* i, no. 6, 15th Dec. 1913, p. 195.

The number of cacao pods formed on a tree is very much out of proportion to the number of flowers produced. Mr. G. A. Jones, who has experimented to find the reason of this, has noticed that if the common red ants which tend green fly about the flowers are kept away, no pollination results. There is, however, no positive evidence to show that red ants have anything to do with the fertility of the flowers.

BURKILL (I. H.). *Clerome gracilis,* **a Butterfly destructive to Palms.**—*Gardens Bulletin, Straits Settlements, Singapore,* i, no. 6, 15th Dec. 1913, pp. 188-186.

The caterpillar of *Clerome gracilis,* Butl. (AMATHUSIINAE) is social in its habits, and has been found to damage *Rhopaloblaste* palms. The caterpillars, when both feeding and resting, are found on the under surface of the leaf, feeding only at night.

BURKILL (I. H.). **The Coconut Beetles,** *Oryctes rhinoceros* **and** *Rhynchophorus ferrugineus.*—*Gardens Bulletin, Straits Settlements, Singapore,* i, no. 6, 15th Dec. 1913, pp. 176-188.

The two beetles legislated against in the Straits Settlements are *Oryctes rhinoceros* and *Rhynchophorus ferrugineus.* The first is the commoner, but individually less destructive; it feeds as an adult in the stems of living palms, generally coconut palms, tunnelling into the softer parts of the stem; it may lay its eggs in these tunnels, but usually it does so in decaying vegetable matter, sawdust, etc., and especially in the central parts of dead palm trunks. The Palm Weevil (*R. ferrugineus*) lays its eggs on the coconut trees, making a small hole for each egg with its long snout. The burrows of the Rhinoceros Beetle (*O. rhinoceros*) give the Palm Weevil access to the inside of the palm, of which full advantage is usually taken. The eggs give rise to

white grubs, which eat out galleries through the softest tissue, thereby destroying the heart of the palm cabbage.

The Rhinoceros Beetle is common from India to the Philippine Islands, wherever large palms abound. In Africa its place is taken by *O. monoceros* and *O. boas*, which attack palms in the same way. In Madagascar are six other species of palm-attacking *Oryctes*. In the Island of Reunion there are two species. Tropical America has a closely allied genus, *Strategus*, which furnishes at least one species of similar habits. Allied genera, *Pimelopus* and *Scapanes* in New Guinea, and *Camelonotus* in America, attack young palms, burrowing into their stems from the ground. The Palm Weevil of Asia, occurs in India, Ceylon, and eastward to the Philippine Islands. It is replaced by *R. phoenicis* in tropical Africa, and by the allied *R. palmarum* and *R. cruentatus* in tropical America.

As to the extent of the damage done by the Rhinoceros Beetle in Samoa, about the beginning of 1912, an official statement was made that 150 trees had been destroyed and 6,000 to 8,000, or one-fifth of the others in affected areas, had received damage enough to postpone their yielding for one or two years. Measures taken to cope with the beetle consisted of collecting the grubs, and trapping the beetle in holes dug in the ground and filled with material such as rotting stumps, which afford suitable breeding places for the insect; the traps were visited periodically and the beetles killed by suffocation with carbon bisulphide. These methods were, however, expensive. The method adopted now against both the Rhinoceros Beetle and the Palm Weevil consists in removing every kind of material from the plantation which would offer a suitable breeding place for the beetles—not only palm stumps, but also all sorts of decaying vegetation, etc. For the removal of dead trees and stumps the author advocates the use of explosives. Experiments made to find the quantity of explosive necessary to destroy trees and stumps showed that to blow a stump completely to pieces, four cartridges of blasting gelatine, placed in a hole drilled in the base of the stump, were sufficient; four cartridges of blasting gelatine similarly placed in the base of a standing dead tree and exploded, brought it down, leaving in the ground insufficient material to serve as a breeding place for the beetle; four cartridges of gelignite did not suffice to do the work thoroughly, nor were three cartridges of blasting gelatine quite sufficient.

The following palms are recorded as attacked by the Rhinoceros Beetle:—*Cocos nucifera* (Coconut), *C. plumosa*, *Martinezia caryotaefolia*, *Phoenix dactylifera* (date palm), *P. sylvestris*, *Livistona chinensis*, *Verschaffeltia splendida*, *Dictyosperma album*, *Hyophorbe amaricaulus*, *Elaeis guineensis* (African oil palm), *Corypha umbraculifera* (Talipot palm), *C. gebanga*, and *Borassus flabelliformis*. The following are recorded as attacked by the Palm Weevil:—*Oreodoxa regia* (Royal palm) *Borassus flabelliformis*, *Phoenix sylvestris*, and the author has found it on *Arenga saccharifera* and *Elaeis guineensis*.

The following papers containing detailed accounts of the life-history, habits and methods of combating these beetles are referred to:—Gehrmann, in Der Tropenpflanzer, xv (1911) pp. 92; Friederichs, K., in the same, xvii (1913) pp. 538 [see this *Review*, Ser. A., ii, p. 26]; Jepson, F. J., Bull. No. 3, Dept. Agric., Fiji, (1912); Preuss, Der Tropenpflanzer, xv (1911), p. 73; McKenna, J., and Shroff, K. D.,

Bull. No. 4, Dept. Agric., Burma (1910), p. 3; Ridley, Rept. on the Destruction of Cocoanut Palms by Beetles, Journ. Asiatic Soc., Straits Branch, No. 20 (1889); Beven, Trop. Agric., N.S., xxiv, May 1905, p. 111; Koningsberger, J. C., Mededeelinger van Slands Plantentuin, xxii (1898), p. 42; Summers, Canadian Entomologist, v, p. 123; Blanford, Kew Bull., 1893, p. 37; Ghosh, C. C., Mem. Dept. Agric. India, Calcutta, ii, No. 10, Dec. 1911.

KEMNER (A.). **Våra Clerider, deras levnadssätt och larver.** [Our Cleridae, their habits and larvae.]—*Ent. Tidskrift, Uppsala*, xxxiv, 4th Dec. 1913, pp. 191-210, 12 figs.

The author gives an account of the following Clerid beetles from Sweden: *Thanasimus formicarius*, L., *Corynetes coeruleus*, De Geer, *Opilo mollis*, L., *O. domesticus*, Sturm, *Tillus elongatus*, L., and *Necrobia violacea*, L. The larvae of these species are described and a key to them is given with figures of the posterior extremities.

The following additions are made to our knowledge of their biology. The larva of *Thanasimus formicarius* is abundant in the galleries of *Myelophilus piniperda*, L., and *Ips typographus*, L. Young larvae occur in June and pupation takes place in August–September, but many hibernate. The Clerid larvae prey on those of the Scolytid beetles. The larva of *Opilo domesticus* was found in wood in the Royal castle of Kalmar in the galleries of *Anobium striatum* on the larvae of which it preys. The small heaps of frass observed on the surface of timber and furniture attacked by *Anobium* are, as a matter of fact, not made by *Anobium*, but by the larvae of *Opilo*; as this larva itself is able to make galleries in the timber it cannot be regarded as wholly beneficial; it is, however, very predaceous, as the great number of empty skins of *Anobium* larvae to be found in the galleries bear witness.

The larva of *Corynetes coeruleus*, a species which Thomson believed to have been imported at Gottenborg, but which now is not uncommon in the southern and central parts of Sweden, was also found on the same occasion preying on the larvae of *Anobium*. As this larva is of smaller size than that of *Opilo domesticus*, it can hunt the larvae of *Anobium* without making any galleries itself, and is therefore presumably more beneficial than the former, but on account of its comparative scarcity its controlling influence is not important in Sweden.

*Necrobia violacea* hibernates as an imago, and its larva is found on carcases, feeding on other larvae.

SAHLBERG (J.). **Till kännedomen om *Haltica engströmi* och dess biologi.** [A contribution to our knowledge of *Haltica engstroemi* and its biology.]—*Ent. Tidskrift, Uppsala*, xxxiv, 4th Dec. 1913, pp. 261-270, 1 pl.

This beetle was described by Sahlberg as far back as 1893, but only provisionally, as only females were found. Subsequently, it was discovered in two different localities in N. Russia, and during recent years again in Finland, the last time near Gammelstad on *Spiraea ulmaria*, leaves of which were riddled with holes, sometimes only the

principal veins being left. From the last-named locality it has spread further each year.

Sahlberg concludes that the species is an immigrant from the east, and that it will continue to spread westwards, and eventually reach Sweden. He succeeded in finding the larva, which, in July, lives in the same manner as the adult does in spring and autumn. A detailed diagnosis and figures of the larva, male, female, and an attacked leaf are given.

**Gas Tar and Mealy Bug.** *Gardener's Chronicle, London*, liv, nos. 1399, 1401, 1407, 1409, 18th Oct., 1st Nov., 6th Dec., 13th Dec. 1913, pp. 279, 309, 407, 427.

Readers of the "Gardener's Chronicle" have communicated the results of their experiences with gas tar as a means of combating the mealy bug (*Pseudococcus citri*) on vines. Mr. A. Shakelton, Chard, says that he found a mixture of 6 to 9 parts of clay and one part of gas tar to do as much injury to the vines as to the pest; he obtained good results by the use of Gishurst compound. Mr. J. Whytock upholds the use of a mixture of clay and tar, finding that it destroys the pest without injuring the vines; the varieties of vine grown by him were Mrs. Pince, Lady Hutt, Gus. Colman, and Appley Towers. Mr. Singleton Oxfordshire, says that the use of a mixture of gas tar and clay in the above proportions caused complete failure of the crop of Black Hamburgh grapes, but he used it successfully in the case of varieties such as Lady Downes and Black Alicante. "J. H. Y." gave up the use of all such methods as painting with tar in favour of fumigation with hydrocyanic acid, which, according to him, is entirely satisfactory, completely killing the pest without injury to the vine or any other plant in the house (except *Tradescantia*). He also found the gas equally successful in killing brown scale (*Lecanium persicae*, Geoff.) on peach trees.

Glaser (R. W.) and Chapman (J. W.). **The Wilt Disease of Gipsy Moth Caterpillars.**—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 479-488.

In August 1912, the authors published a paper in *Science* entitled: "Studies on the Wilt Disease or Flacherie of the Gipsy Moth." [See also this *Review*, Ser. A. i, pp. 33–36.] More extensive observations and experiments conducted during the past year have led them to modify some of their original views concerning this disease. The conclusions drawn from the first series of observations concerning the mode of infection and general pathology were, on the whole, correct, but the etiological connection of a micrococcus with the disease was not so well grounded. The micrococcus described in 1912, and believed to be connected with the wilt disease, has proved to be a casual intestinal parasite. The reason for eliminating this organism (*Gyrococcus flaccidifex*) from the possible excitors of the disease are the following: If smears were made from caterpillars dead but a short time, no bacteria could be found. Cultures made from such cater-

pillars on caterpillar and other nutrient media remained sterile. If serial sections are made of diseased caterpillars obtained in the field, polyhedral bodies will be found in abundance, but no bacteria in the tissues, and usually the intestinal lumen will be free from micro-organisms in general.

Great care was taken to procure healthy uninfected caterpillars for the experiments, by collecting from localities where no epidemic was evident. The caterpillars were divided into groups, and each group was subjected to slightly different conditions of temperature, light, moisture, etc. This gave the disease, if latent, every chance of becoming manifest, since conditions unfavourable to the caterpillars are believed to assist its development. If the disease under one or other of the conditions broke out, the whole of the caterpillars collected from the same locality were discarded. Such a method of obtaining healthy individuals is much more satisfactory than the blood test, as the controls showed.

Many views have been held regarding the agents responsible for the disease. Escherich and Miyajima in 1911 were of the opinion that the polyhedral bodies were the carriers of the virus; Bolle believed that a Microsporidian (*Microsporidium bombycis*) was responsible. According to Knoch, little refractive granules appear in the blood corpuscules; these multiply and infect the nuclei of tissue cells, where their amoeboid membrane hardens and they change into polyhedral bodies; he further states that the minute granules, which resemble the Chlamydozoa of Prowazek, are the vegetative, the polyhedral bodies the resting stages of the causative organism. Prowazek was able to infect caterpillars with the disease by means of a filtrate of emulsified diseased material, which contained neither bacteria nor polyhedral bodies; his experiments, in the author's opinion, are suggestive, but not conclusive, as no controls were made, and the blood test was the only one used in diagnosing the health of the caterpillars.

Thirty filterable viruses are known to be responsible for diseases in man and the lower mammals, but only one has been described in insects, viz., that of sacbrood, a bee disease discovered by White in 1913. [See this *Review*, Ser. A, i, p. 186.]

Coming to the experiments made by the authors, it is first stated that the reason why filtrates of diseased material gave negative results in 1912, was that the emulsion was too concentrated. This year, caterpillars which died of the disease were crushed with just enough sterile water to facilitate the crushing. This material was then strained through cheese-cloth and filtered by means of suction through filter paper; the filtrate was diluted in one case with fifty, in another with twenty-five times its volume of water. This was then passed through a Berkefeld "Grade N" filter and used for the infection experiments. The filtrate was free from bacteria and polyhedral bodies. Nothing could be observed except some very minute dancing granules, also noticed by Prowazek in his experiments with silkworms. A large number of caterpillars were fed with the Berkefeld filtrate, smeared on red oak leaves. In one series of experiments 50 caterpillars were fed with the filtrate, in another 40, in a third 20. The same number was fed with material before it was passed through the Berkefeld filter, and a large set of controls, fed with Berkefeld filtrate which had been sterilised by autoclaving, accompanied each series.

Out of the entire lot of caterpillars (110) fed with unsterilised Berkefeld filtrate, 28 died with typical wilt symptoms. Polyhedral bodies were abundant, but there were no bacteria. Other caterpillars died from other causes; the caterpillars dying thus differed from those dying of wilt disease in being tough instead of flaccid, and in the absence in them of polyhedral bodies. Some of the caterpillars were killed by the Tachinid parasite, *Compsilura concinnata*. A greater number of caterpillars (48 out of 85) died in the experiments with the unfiltered virus. This seems to show that the virus is filterable, but with difficulty. Among the entire number of controls, 162 caterpillars, only three died of wilt, equivalent to about 1·8 per cent., a very small percentage, which can be overlooked as an experimental error.

The polyhedral bodies have as yet revealed nothing of a parasitic nature; they may be a resting stage of a filterable vegetative form, but the authors are rather inclined to regard them as reaction bodies. They are possibly products of nuclear digestion, produced by the virus invading the nuclei and digesting the chromatin.

One more matter is considered, viz., the question as to whether the disease is carried by the air, as is held to be the case by W. Reiff. Details are given of the experiments carried out to test this view, and the conclusion is that the wind is not an important factor in transporting the disease, and that infection in nature occurs when caterpillars feed on leaves soiled by the juices of dead individuals.

A striking phenomenon observed in all the experiments was the large number of moths obtained from caterpillars which had been repeatedly infected. This seems to suggest a degree of immunity possessed by some of the caterpillars, and agrees with the observations in the field, where, in a given locality, the disease raged for several weeks, and yet moths were seen later in abundance.

Gough (L. H.). **The Fumigation Campaign of 1912-1913.**—*Agric. Jl. of Egypt, Cairo,* iii, part 1, 1913, pp. 38-41.

The fumigation with hydrocyanic acid gas in Egypt of citrus trees affected with scale-insects was commenced by the Department of Agriculture in January 1912. Two gardens containing about 3,000 small trees were fumigated with satisfactory results. For the fumigation campaign of 1913–1914, the equipment consisted of seventy-two fumigation sheets, of which thirty were 20 feet in diameter, thirty 34 feet in diameter, and twelve 45 feet in diameter. These, except five of the largest, had been made at Cawnpore to the pattern given in Mr. Woglum's paper (Fumigation of Citrus trees, U.S. Bureau of Entomology, Bull. 90). The cloth used was $7\frac{1}{2}$ oz. drill; the dosage was calculated from the tables given in that paper, one ounce charges being given in every case to allow for the loose texture of the cloth. A start was made in October 1912, in the garden of H.H. the Khedive, at Kubba, the fumigation campaign being carried out by the staff, consisting of a European Inspector, and at first seven, but generally two, students. The tallest trees fumigated were 23 feet high, those taller being usually too old to be profitable. The balance sheet showed a small loss.

The scale-insect (*Aspidiotus aonidum*, L.), which does the damage in Egypt, is a recent introduction, and the depreciation it causes may be 50 or 60 per cent. The improvement due to fumigation pays for itself in the first season and leaves an additional profit over and above last year's takings.

WILLIAMS (C. B.). **On two new species of Thysanoptera from the West Indies.**—*Jl. Econ. Biol., London,* viii, no. 4, 16th Dec. 1913, pp. 209-215, 2 figs.

Two collections of Thrips were received by the author from Mr. F. Birkinshaw, of the Agricultural Experiment Station, Kingstown, St. Vincent. The insects had been taken in the grounds of that station on cacao and bitter cassava (*Manihot utilissima*). It was stated that the manihot leaves were injured somewhat and consequently did not develop properly; the insects however, did not appear to be a source of great injury so far as the yield is concerned, unless it was present in large numbers. The collection of insects taken on cacao consisted entirely of larvae and adults of *Heliothrips rubrocincta*, Giard; that from cassava contained two species, both of which appear to be new. One belongs to the genus *Frankliniella*, and has been called *F. melanommatus*; for the other it has been found necessary to erect a new genus of the family THRIPIDAE, and the name *Corynothrips stenopterus* is proposed for it.

THOMPSON (W. R.). **La Spécificité des Parasites entomophages.** [Specialisation of habit in Parasites of Insects.]—*C. R. de la Soc. Biol.*, lxxv, no. 36, 19th Dec. 1913, pp. 559-560.

In a second communication upon this subject [see this *Review*, Ser. A, ii, p. 16], the author describes experiments he made with the Tachinid parasite *Sturmia scutellata*, R.D., supplied with eggs of *Lymantria dispar*, *Clisiocampa disstria*, *C. americana*, *Vanessa antiopa*, *Hemerocampa leucostigma*, and *Orgyia antiqua*. In the first three the parasites developed normally; they did not develop at all in *Vanessa*. In the last two, although the eggs were given in large numbers, not a single perfect larva was obtained; upon dissection, 44 larvae of the parasite were found, but of these only one had grown, and instead of being as usual in the muscles of the host larva, they were free in the general body cavity, and were much smaller than is usual with larvae at that age. Besides these, 42 larvae were found dead and decomposing and surrounded by phagocytes.

It is evident that *Sturmia scutellata* cannot live and develop in surroundings other than those furnished by such hosts as *L. dispar* or *C. disstria* and *americana*. *L. dispar* belongs to the LYMANTRIIDAE, whereas *C. disstria* and *C. americana* belong to the LASIOCAMPIDAE; there is not, therefore, necessarily any relation between the taxonomic position of Lepidoptera and their special parasites. On the other hand, different parasites can often live in a limited number of hosts under the action of certain ethological factors that are at present difficult to determine.

GOWDEY (C. C.). **A List of Uganda Coccidae and their Food-plants.**—*Bull. Entom. Research, London*, iv, pt. 3, Nov. 1913, pp. 247-249.

The list which the author gives of the COCCIDAE of Uganda is the result of an extended search among the flora of that country. Owing to the favourable climatic conditions and the luxuriance of vegetation, Coccids continue to grow and multiply throughout the year. The family is abundantly represented, no less than 49 species being enumerated.

DUDGEON (G. C.). **A Proposed Method of Controlling the Ravages of Leaf-eating Caterpillars.**—*Bull. Entom. Research, London*, iv, pt. 3, Nov. 1913, pp. 243-245.

In Egypt, where temperature and humidity exhibit practically no variation which can seriously affect agriculture, and where the land is irrigated by a well organised system of canals, which serve also to fertilise the soil, almost the only uncertain factor which may affect results is the presence or absence of insect pests. The isolated position of Egypt with respect to other countries makes it less liable to the introduction of pests, but on the other hand, when a pest has gained a foothold, it remains unattacked by natural enemies, which in less isolated countries would tend to exterminate it. The present paper deals with the so-called "cotton worm," the caterpillar of *Prodenia litura*, F., a Noctuid moth of the sub-family ACRONYCTINAE. Previous to 1910, the Government had legislated against this pest, but the methods employed were purely mechanical, consisting of destroying the egg-masses as soon as they appeared ; other methods employed were equally costly and less efficacious. In 1910, upon the formation of the Agricultural Department of Egypt, attention was turned to the possibility of introducing disease among the larvae. Experiments were made in which bodies carrying diseases known to attack lepidopterous insects were introduced and the larvae of *P. litura* were infected with them. Muscardine and other fungoid diseases were found unsuitable, owing to the dryness of the climate. Pebrine and flacherie were tried, but it was impossible to say what the results were, as a superinfection occurred due to a protozoan disease known as "grasserie" (*Microsporidium polyedricum*, Bolle). This disease was so efficacious that all the larvae of *Prodenia* in the experimental area were killed. A month later it was found difficult to procure *Prodenia* uninfected by the disease from any part of the country. The author believes that the outbreak was spontaneous, and that it had nothing to do with the laboratory experiments. Steps were taken to secure the continuity of the disease. In experiments to find out how this might best be accomplished, 30,000 silkworms were fed with food sprayed with water in which were the macerated remains of an infected silkworm. They all died before reaching maturity, mostly on or shortly after the fourth day. A similar experiment was made, using an infected cotton worm instead of a silkworm ; the worms did not die so quickly, but no larva reached the spinning stage. Later, in May 1913, cotton worms were infected by food sprayed with water containing a single macerated diseased silkworm ; in three days 50 per cent. had succumbed, only six survived to pupate, and it was not expected that these would emerge.

As the cotton worms in the field were rare, it was not possible to test these experiments on a large scale in the open. The method that would be adopted in the open would be to disseminate the disease by artificial spraying of the plants with water containing infected larvae. Investigations were, at the time of writing, not sufficiently complete to make it possible to say what the effect of climate would be on the infective power of the disease, but there is no doubt that the rainless climate of Egypt would facilitate its dissemination by spraying.

Peacock (A. D.). **Entomological Pests and Problems of Southern Nigeria.**—*Bull. Entom. Research, London,* iv, pt. 3, Nov. 1913, pp. 191-220, 2 figs., 6 pl.

This report deals with the investigations made by the author in Southern Nigeria in 1911–1912. Insects attacking cotton are the cotton stainers (*Dysdercus superstitiosus*, F., and *Oxycarenus dudgeoni*, Dist.); boll-worms (*Diparopsis castanea*, Hmp., *Earias biplaga*, Wlk., and *Chloridea obsoleta*, F.); leaf-rolling caterpillars (*Sylepta derogata*, F., and *Zebronia phenice*, Cram.); cotton aphis (*Aphis gossypii*, Glov.); leaf-eating beetles (Coccinellidae: *Epilachna chrysomelina*, F., *E. similis*, Muls.; Lagriidae: *Lagria villosa*, F., and *L. viridipennis*, F.; Curculionidae: *Siderodactylus* sp.; Chrysomelidae: *Syagrus calcaratus*, F., *Plagiodera circumcincta*, Sahlb., *Ootheca mutabilis*, Sahlb., and *Nisotra uniforma*, Jac.); leaf-eating caterpillars (*Euproctis* sp., *E. lyonia*, Swinh.); scale-insects (*Pulvinaria jacksoni*, Newst., and *Ripersia* sp.).

The study of the Red Cotton Stainer (*Dysdercus superstitiosus*) occupied considerable attention; it is the worst pest of Southern Nigerian cotton, and does an immense amount of harm both to the seed and to the lint. It is widely distributed in the Colony, being mostly in evidence during March, the time of the ripening and shedding of the seed of the silk-cotton tree, and from September to the end of November, during the ripening of the cotton bolls. The bugs suck the juices of the rich oily seeds of the cotton, Hibiscus and silk-cotton tree, and stain the white lint of their food-plants with yellow excretory juices. The eggs are laid in clusters, the average number in each being about 63. The breeding period lasts for about 9 to 10 weeks; the newly hatched young soon become active, and crawling up the cotton stalk, swarm upon the opened bolls and suck the cotton seed; there are five moults. Natural enemies have not been discovered. It is of great importance to keep the plantations free from all weeds, etc.; the presence of the silk-cotton tree has also been shown to be prejudicial. Collecting the stainers is best undertaken early in the cotton season. A collecting net suitable for the purpose is described and figured. The planting of trap-crops to entice the stainers away from the cotton plants is suggested, but was not tried. General measures are recommended, such as gathering the cotton as soon as it is ripe, sunning it well, and constantly turning it over, which causes the stainers to crawl away, and the burning of old cotton-stalks, which harbour the pest. Some foreign cottons are not so liable to attack as the native varieties, but their lint-bearing qualities are not so good.

The Black Cotton Stainer (*Oxycarenus dudgeoni*) is also widely distributed; it appears in November. The insect feeds and breeds

in the opened cotton bolls, sucking the juices from the seeds. The eggs are laid in clusters of apparently about 20 ; the wingless young swarm in December. Their favourite food-plants are species of Hibiscus. The extent of the damage they do has not been estimated exactly, but their abundance suggests that it is considerable. The remedies advocated for the Red Cotton Stainer apply equally to this species.

The boll-worms mentioned above are widely distributed ; the caterpillars bore into the unopened ripening cotton bolls and devour the seeds inside, while *Diparopsis castanea* and *Chloridea obsoleta* eat the flower-buds also. The damage is serious, and so far no natural enemies have been discovered. Spraying with lead chromate is the most effective remedy. A careful look-out should be kept for leaf-rollers and boll-worms during August and September, and immediately their presence is detected the leaves, bracts, bolls, and buds should be thoroughly sprayed ; the number of sprayings must depend upon the condition of the crop as the season advances ; at the end of the season all the old stalks with diseased bolls should be burnt. The same spray will effectively control the various leaf-eating caterpillars.

The cotton aphis (*Aphis gossypii*) is kept well in check by natural enemies, including lady-bird beetles (*Chilomenes lunata*, F., and *C. vicina*, Muls.), hover flies (*Paragus borbonicus*, Mcq., *Syrphus aegyptius*, Wied., and *S. nasutus*, Mcq.), and lacewing flies (*Hemerobius* sp. and *Chrysopa* sp.).

The insects affecting cacao are leaf-eating caterpillars (*Diacrisia maculosa*, Stoll, *Diacrisia* sp., *Prodenia litura*, F., and *Rhopalocampta forestan*, Cram.) ; leaf-eating beetles (*Adoretus hirtellus*, Castn.) ; a pod borer (? *Myelois*)* ; scale-insects (*Pseudococcus virgatus* var. *madagascariensis*, Newst. and *P. citri*, Risso).

The measures for combating leaf-eating caterpillars and beetles resolve themselves into :—(1) clean farming ; (2) the segregation of cacao-beds from maize, since many pests of the latter migrate to the cacao ; (3) a combination of hand-collecting and spraying with Paris green or lead arsenate.

Red tree ants (*Oecophylla*) are not harmful to cacao trees, but their presence adds a difficulty to the collecting of the ripe pods, owing to their vicious bites. The best method of combating them is to cut down their leaf-nests and destroy them. An Ichneumonid, *Metopius discolor*, Tosq., was bred from *Prodenia litura*, and a Tachinid fly of the genus *Sisyropa* from *Diacrisia maculosa*.

The author says that the general condition of the native cacoa farms is at present bad, the chief defects being that the land is not thoroughly cleared and stumped ; that the trees are not planted so that they may be readily worked; and that decaying branches and pods are left on the trees and on the ground.

The insects recorded as affecting maize are *Cirphis* ? *phaea*, Hmp., *Calamistes praepallens*, Hmp., *C. fusca*, Hmp. ; leaf-eating beetles (*Lagria villosa*, F., and *L. viridipennis*, F.), and the locust, *Zonocerus variegatus*, L. *C. phaea* should be combated by burning the grass or

---

* [From specimens received from Mr. W. H. Patterson, Government Entomologist in the Gold Coast, this insect proves to be *Characoma stictigrapta*, *Hmp.*, a Noctuid moth of the sub-family SARROTHRIPINAE. The species was also bred from the fruit of kola by the late Mr. L. Armstrong in the Gold Coast.—ED.]

bush round the fields; when once the caterpillars have gained the maize plants damage can only be prevented by spraying. Not enough work has been done upon the other pests of maize to warrant giving specific remedies.

The insects recorded as damaging yams are the beetles, *Prionoryctes caniculus*, Arrow, *Crioceris livida*, Dalm., *Apomecyna parumpunctata*, Chev., *Lagria villosa*, F., and *L. viridipennis*, F., and *Zonocerus variegatus*. To combat *P. caniculus* spraying with a stomach poison is suggested, a method which applies also to *C. livida*.

The larvae of the following moths are recorded as affecting Funtumia rubber:—*Glyphodes ocellata*, Hmp., *Nephele aequivalens*, Walk., which is of rare occurrence, and *Thermopteryx elasticella*, Hmp.; also a Thrips, *Physothrips funtumiae*, Bagn.

Mahogany trees (*Khaya senegalensis*) suffered from the attacks of lepidopterous larvae, which bore into the stem. Arabian coffee is affected by a beetle, *Ootheca mutabilis*, Sahlb., and the bugs, *Antestia variegata*, Thunb., *Riptortus tenuicornis*, Dall., and *Dictyopharina serene*, Stål. Other plants attacked by insects are recorded, namely, the oil palm, attacked by a weevil, *Rhynchophorus phoenicis*, F.; the coconut palm, by another weevil, *Temnoschoita quadrimaculata*, Gyl.; kola, by a Rutelid beetle, *Adoretus hirtellus*, Castn.; and okra by various cotton pests.

The author concludes by pointing out the need of pioneer entomological research, which is essential before the necessary instruction with regard to insect pests can be given to the native farmers.

Grossheim (N. A.). **Къ біологіи люцерноваго долгоносика и его паразитовъ.** [On the biology of *Phytonomus murinus F.* and its parasites.]—**«Энтомологическій Вѣстникъ»** [*Messenger of Entomology.*] *Kiev*, ii, no. 1, 1913, 21 pp.

This investigation was undertaken upon a request from the Department of Agriculture of the United States, transmitted through N. V. Kurdjumov, for information concerning the parasites of *Phytonomus murinus*, the lucerne weevil. The author conducted his enquiry in the province of Kuban, where, according to him, these insects threaten to develop in the near future to a dangerous degree.

The hibernating beetles emerged during April, but disappeared again under the earth or inside the plants on cold days. Just after emergence the insect does not touch the leaves, but feeds on the summit of the stem, in which it gnaws holes. The eggs are usually deposited in the tender ends of the stem, but also on branches, and frequently near the roots. As a rule, the females prepare a hole in the stem for the reception of the eggs, but occasionally they make use of the stipules, piercing through them and depositing the eggs in the space between them and the stem. The eggs are most frequently arranged in small heaps, which are often roughly conical and sometimes egg-shaped; or more rarely, they are laid in a chain-like row of not more than nine eggs; or again, when deposited on the stipules, they are arranged in a flat-topped pile perpendicular to the stem. The eggs are usually covered by a layer formed of the excrement of the female, but sometimes this is absent, the last egg serving as a cover for the heap. The author figures the various types of egg-heaps, and gives a table

summarising his observations on the mode of oviposition by one female, which deposited in one and a half months 690 eggs in 47 heaps; in favourable weather there were up to five ovipositions daily, while in bad weather none took place. Oviposition proceeds from the end of March to the end of June, but the number of the beetles decreases noticeably from the middle of June.

The development of the larvae inside the eggs occupies from four to 21 days, depending chiefly on the weather conditions; apparently the larvae which issue first remain inside the egg-cluster till the other larvae appear, as their exit from the heap always takes place at the same time. The author describes and figures the various stages of the larvae, the progressive changes in their habits, and the injuries done to the leaves. The cocoon is constructed among the leaves, three, or sometimes only two, leaves being drawn together into the form of a tube. The pupal stage lasts from six to eleven days.

Parasites were found of all the stages of *Phytonomus murinus*. The eggs are attacked by a small Pteromalid, which has not been identified. This insect proved to be an external parasite, laying only one egg in an egg-heap of the *Phytonomus*; the larva, after feeding on the eggs of the host, pupates without a cocoon inside the heap, the pupal stage lasting 13–15 days. The whole development of the parasite lasts from three to four weeks, so that only two broods of it appear during the summer; in the year of the author's investigations, the percentage of eggs infested by this parasite was 13·33.

*Canidiella curculionis*, Thoms., infested 3·16 per cent. of the larvae of *P. murinus*. This external parasite attacks the larvae of the host in their latest stages, and the infested larvae prepare a cocoon, but do not pupate. The parasitic larva pupates inside the cocoon of the beetle remaining there during its whole pupal stage, which for the second generation of the parasite lasts through the winter. The cocoon of the parasite possesses a remarkable power of jumping, which the author explains, accompanying his explanations by drawings. He suggests that the purpose of this jumping is either to protect the pupa from hyperparasites, or gradually to destroy the cocoon of the host. Some undetermined PTEROMALIDAE were found to be hyper-parasites of *C. curculionis*; cocoons of the parasites so infected lose their jumping power, besides turning transparent and bright yellow.

The larvae of *P. murinus* are also infested by two Chalcids, *Tetrastichus* sp., which is a primary internal parasite, and *Dibrachoides* (*Pteromalus*) *dynaster*, Först., an external parasite; the percentage of infection by these two species is low.

As to the parasites of the pupae of *P. murinus*, there were noticed *Eulophus* sp., an external parasite, and *Pimpla maculator*, F., an internal one; one specimen of the latter was also bred from a larva of the host. This Ichneumonid is much the most important parasite, as 45 per cent. of the pupae were attacked by it. *Catolaccus alter*, Ratzb., was obtained as a hyperparasite of *Pimpla maculator*.

Besides parasites, there were noticed also as enemies of *P. murinus*, the larvae of *Chrysopa* sp., which destroy the cocoon of the weevil and feed on the pupa, and a small red acarid. All these enemies and parasites together destroyed in the season under consideration, 71 per cent. of *P. murinus*.

The author deals further with remedies, which can be best applied against the larvae, as all other stages are more or less effectively protected. He mentions the following measures :—(1) Flooding of the lucerne crops, which remedy cannot however be of importance under the conditions prevailing in the Russian steppes ; (2) drawing a wire broom over the field ; (3) harrowing with a disc harrow, which is the best remedy ; and (4) burning with naphtha.

Golovianko (Z.). **Таблицы для опредѣленія наиболѣе обыкновенн-ыхъ личинокъ пластинчатоусыхъ жуковъ.** [Identification tables for the more common Lamellicorn larvae.]—Pubd. by A. F. Devrien, St. Petersburg, 1913, 26 pp., 108 figs., 3 tables.

The tables contain descriptions of the larvae of the following beetles, many of which are important pests :—Melolonthidae : *Melolontha melolontha*, L., *M. hippocastani*, F., *Polyphylla fullo*, L., *Anoxia pilosa*, F., *Rhizotrogus solstitialis*, L., *Serica brunnea*, L. ; Rutelidae : *Phyllopertha horticola*, L., *Anisoplia deserticola*, Fisch., *A. segetum*, Hbst., *Anomala praticola*, F., *A. aenea*, de G. ; Cetoniidae : *Cetonia aurata*, L., *Epicometis hirtella*, L., *Oxythyrea stictica*, L., *Osmoderma eremita*, Laxm., *Gnorimus nobilis*, L., *Trichius orientalis*, Reitt. ; Dynastidae : *Pentodon monodon*, F., *Oryctes nasicornis*, L. ; Geotrupidae : *Geotrupes stercorarius*, L., *Lethrus apterus*, Laxm. Aphodiidae : *Aphodius subterraneus*, L. ; Lucanidae : *Lucanus cervus*, L., *Dorcus parallelopipedus*, L.

Carson (G. M.). **List of insecticides and fungicides.**—*Entom. Notes, Territory of Papua, Dept. Agric., Port Moresby.* Series A, no. 5, 15th Sept. 1913, 3 pp.

The following spray mixtures are tabulated :—Lead arsenate : Lead arsenate 1 lb., water 100 gals. ; kerosene emulsion (*a*) : soft soap 1 quart, hot water 2 quarts, kerosene 1 pint ; kerosene emulsion (*b*) : hard soap 1 lb., boiling water 1 gal., kerosene 2 gals. ; red oil mixture : red oil 1 gal., soft soap 1 lb., water 14 gals. ; resin wash : resin 20 lb., caustic soda 3½ lb., fish oil 3 pints ; resin compound : powdered resin 3 lb., washing soda 3 lb., water 1 gal. ; Bordeaux mixture : bluestone 6 lb., lime (unslaked) 4 lb., water 40 gals. Concise instructions for preparing these and remarks as to their use are given. The list of chemicals, sprayers, etc., and the section headed " General Notes," are of practical value.

Pratt (H. C.) and South (F. W.). **Progress Report on Locust Work since June 1913.**—*Agric. Bull. F.M.S. Kuala Lumpur*, ii, no. 3, Oct. 1913, pp. 53-59.

The authors report that in Negri Sembilan and Selangor there was a marked increase of locusts during the first part of the year 1913. Destruction of large numbers of hoppers has been carried out, though the work was only in the experimental stage. By far the most important of the food-plants of these insects are grasses, especially "lalang" and "love-grass," commonly found along the roads in those districts. These form their staple food supply, but should the insects

continue to increase as they are doing, other food will be required. It has been reported that young coconuts have been destroyed by continued attacks of flying locusts and hoppers have eaten down the paddy to below water-line. Of the garden plants, the bamboo is very liable to attack. Tennis-lawns, golf-greens, padangs and race-courses have been rendered brown and unsightly by these insects in a few hours. In the Malay kampongs, sugar-canes, bananas, pine-apples, paddy and coconuts have been eaten. Slight damage has also been done to rubber trees by the weight of the insects settling on the branches or main stems of young plants causing them to snap. The rubber leaves are only occasionally nibbled.

The driving and pit system of dealing with these insects used in other parts of the world entails an immense labour force, and much expense in digging ditches, and on this account can only be used for small swarms in the Malay States, where a large amount of labour is not generally available. Moreover, the hoppers are able to get out of the pits of almost any depth, unless killed upon entering them or prevented from escaping by a gang of coolies or other means. Another method, not used in Malaya, is that of driving the hoppers into drainage ditches, where kerosene has been added to the water. This surface film of kerosene on the water soon causes their death. Arsenical poisons are probably effective, but considered too dangerous for use, since the poisoned grass is liable to be eaten by animals. Spraying with kerosene, where used in strong emulsion, has deadly effects, but the damage it causes to the rubber fittings of the sprayers has prevented its use on a large scale. The only practical method in such a country consists in driving the young hoppers into V or W-shaped enclosures, which end in special traps constructed for the purpose, and which can be erected in three minutes by three coolies. The traps consist of strong canvas bags, the entrance to which is two feet high, and is approached by an inclined plane 4 feet each way, which is also the width of the bag. The remaining two sides and back of the bag are 4 ft. 6 in. high, and the two sides are prolonged into two wings 4 ft. in length, and attached at the bottom to the sides of the inclined plane. The whole is supported by iron stakes, furnished at the top with hooks from which the bag is suspended by steel rings, sewn on to the material at the corners. The same means is also used to support and stretch the wings. The shape of the bag is preserved by four bamboo poles run through folds two feet from the ground. These bamboos are held in place by iron stakes with rings at the top. Against the front bamboo the inclined plane is stretched, being held in position by a bamboo, run through a fold at the bottom and fixed to the ground by short iron or other stakes. To prevent the escape of hoppers below the wings and inclined plane, a little earth is thrown on the wings and in front of the inclined plane.

The escape of the hoppers from the bag is prevented by strips of American cloth from 6 ins. to 12 ins. wide, which are sewn on the inside from the height of the opening downwards. The sides of the enclosure consist of strips of strong calico 4 feet 6 inches wide and 15 yards in length. This material is very portable. On the inside two parallel strips of American cloth 6 inches wide are sewn at the height of 3 feet and 4 feet from the bottom. At the top is attached a rope strongly sewn on with twine, leaving apertures every inch. The sheeting is

suspended from iron stakes 4 feet 6 inches in length, furnished with a hook and over which the rope is hung. The sheeting is held down by a continuous line of soil heaped on its free edge.

A quarter of a mile of this apparatus can be placed in position before an advancing swarm by ten proficient coolies in half an hour. Moreover, it is easy when the swarm is inside the enclosure to cut off their retreat by closing the open end of the V or W. It has been found that when a large swarm of hoppers has eaten out the available food supply behind it that they will pour into trap bags for eleven hours without stopping, necessitating the erection of further traps, or changing those that are full, and this with practically no driving. It is a remarkable sight to see these insects hopping towards the trap, pouring up the inclined plane and dropping into the trap in a stream that is almost as regular as a stream of water, killing each other by their weight and struggling inside the trap. Circling out of the V may occur, but can be stopped either by placing subsidiary traps on the arms of the wings and facing the original trap, or, which is easier, by modifications in the erection of the sheeting. In most cases it is desirable to drive the swarms by means of coolies placed behind them. In one instance, near Setapak village, with three traps, 300 yards of sheeting and 15 coolies, about two million insects, a portion of a swarm, were destroyed during the day. Rewards offered to natives for information as to the locality of breeding grounds or hoppers have been the means of locating hundreds of swarms.

Pratt (H. C.). **The Locust Pest in Malaya; a Short Survey and a Brief Description of its Life-History.**—*Agric. Bull. F.M.S., Kuala Lumpur*, ii, no. 4, Nov. 1913, pp. 76-80.

Before organising the campaign against the locust pest several methods of control were tried, and the most successful was found to be the driving and trap system. No reliable information as to the origin of these insects is available. They first appeared in the Malay States about 20 months ago in the neighbourhood of Port Dickson, and since then have spread, mostly in a northerly direction, over 100 miles of country. The life-history of the locust has now been completely worked out, and the details are given. The species does not appear to have been identified.

South (F. W.). **Work on Locust Destruction in September.**—*Agric. Bull. F.M.S., Kuala Lumpur*, ii, no. 4, Nov. 1913, pp. 85-88.

In Selangor there were three main centres of distribution of hopping locusts, the district of Ulu Selangor, the neighbourhood of Kuala Lumpur and the district between Kuala Lumpur and Kajang. In each district was a Special Assistant who employed at first only one or two gangs, though these were increased later as fresh supplies of apparatus were obtained. The results of the month's work were 5,322 kerosene tins full of hoppers in all stages, representing 104 swarms. In addition, 2,083 kerosene tins of hoppers were reported to have been captured by the Malays in Kuala Kubu districts, working independently with their own apparatus, copied from that used by the Department. In Negri Sembilan, at the end of the month, two breeding grounds and one

swarm of hoppers had been reported in the Tampin districts. In the Coast district numerous small swarms occurred, and the Special Assistant with one gang destroyed 42 swarms. The deficiency in the amount of apparatus has constituted a severe handicap on the work. The damage caused by the locusts has not been very serious.

MASKEW (F.). **The Gunworm of the Grape.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 677-679, 2 figs.

The material used for this description of the gunworm (*Sciopteron regale*, Butl.), a Sesiid moth, was taken from some confiscated vine-cuttings brought from Yokahama to San Francisco by a passenger. Swellings on the twigs indicated some abnormality, and were found to contain the larvae of a Sesiid borer. These larvae bore into the canes of the grape-vines and are very destructive in Japan. The paper concludes with a description of the life-history of the insects by E. O. Essig.

ESSIG (E. O.). **The Western Twig Borer.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 681-684, 3 figs.

The author received twigs of apricot trees severely injured by a Bostrychid beetle, *Amphicerus punctipennis*, Lec. The burrows, which may occur anywhere on the twigs, vary from one to three inches in length and are about one-eighth of an inch in diameter. The beetles bore into the twigs for food and protection, not to deposit eggs, and the burrows cause the smaller twigs to break. This species seems to prefer dead or dying wood. A desert plant (*Prosopis juliflora*, D. C.), is reported by Dr. Van Dyke as the normal food-plant, and other known hosts are pear, dead fig-tree branches, dry canes of the grape-vine, apricot and dry orange wood. It has a wide distribution in South West California, Dr. Van Dyke specially mentioning Los Angeles and Imperial Counties. Control measures suggested are, the destruction of breeding places if possible, the elimination of unhealthy trees and all dead wood, and the maintenance of trees in good growing vigour.

VAILE (R. S.). **Effects of Hot Weather on Lemon Trees Sprayed with Lime-Sulphur.** *Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, p. 692.

Lemon trees sprayed with both Rex and Ortho lime-sulphur solutions ten days before the excessive heat were found to be very seriously burned, and a large proportion of the fruit was completely ruined. The author states that he has never seen spray injury due to heat arise after so long an interval.

VOSLER (E. J.). **Calendar of Insects Pests and Plant Diseases.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 695-699, 1 fig.

Among the deciduous and citrus fruit insects the fall cankerworm (*Alsophila pometaria*, Harr.) is known as a pest of apple, prune, cherry, and apricot. The eggs are attached to the bark in masses of from

60 to 200, placed in exposed situations by the wingless females which emerge from the middle of October to the middle of December. The use of bands around the tree-trunk, placed in September and October, has been recommended to trap the females as they ascend the trunks to deposit their eggs.

The use of distillate emulsion for spraying for the black scale on olive is recommended by E. O. Essig, his formula being 20 gals. of distillate (28 degrees Baumé), 30 pounds of whale-oil soap and 12 gallons of water; dissolve the whale-oil soap in the water, heating it to the boiling point, add the distillate and agitate thoroughly while the solution is hot; for use, add 20 gals. of water to each gallon of the above mixture. The crude oil emulsion (formula given below) is also recommended. For the brown apricot scale, Essig recommends spraying with caustic soda and distillate, or distillate emulsion and crude oil emulsion, when the trees are dormant. The formula for the distillate emulsion is the same as that for the black scale. The formula for the caustic soda mixture is: Water, 200 gals.; caustic soda (95 per cent.), 7 lb.; and 10 gals. of distillate (28 degrees Baumé). Fill the spray tank with the required amount of water, add the caustic soda which has been dissolved in a small amount of water, and then add the distillate; keep the agitator going rapidly while applying the spray. For the crude oil emulsion the formula is: Water, 175 gals.; liquid soap, 3 gals.; and crude oil (direct from wells) 25 gals. Fill the spray tank with water, add the liquid soap, agitate for one minute, then add the crude oil, continuing the agitation while the spray is being applied. Fumigation is also recommended as soon as possible after the young scales are hatched. Three-fourths or even half of the regular schedule No. 1 may be used, a two-thirds dosage appearing to do as well as a full dosage.

Among the cereal and forage crop insects, the clover seed Chalcid (*Bruchophagus funebris*, How.) is reported as a serious pest. This Chalcid will infest the seed of red and crimson clover, besides alfalfa, a favourite host; they feed on the substance of the seed and often totally destroy the contents. The eggs are deposited in the seeds. The adults do not emerge from the seeds till the following spring or early summer. Remedies for this pest are in an experimental stage. Professor F. M. Webster suggests as a preventive measure the destruction of all outstanding alfalfa plants in the autumn, the chaff and stems to be burned. Delaying the seed crop by early pasturing or clipping of the first growth in the spring until the seed Chalcid has done most of its destructive work, promises to be useful as a control measure.

For the destruction of locusts or grasshoppers a mixture used by the Government of South Africa is recommended. This consists of one gallon of treacle mixed with one half gallon watery solution of arsenite of soda (69 per cent. white arsenic). This mixture is diluted for newly-hatched locusts to one part to 66 of water; when used against locusts two weeks old, it is diluted one part to 50 of water. Where the application is made in fields not accessible to domestic animals, farmers have used it as strong as one to 30 or 40. Since the egg-masses of grasshoppers are deposited in the hard, uncultivated lands during the late summer and early autumn, ploughing, harrowing, and disking such waste lands to a depth of several inches in the late autumn will lessen future attacks.

For the destruction of the alfalfa caterpillar (*Autographa gamma californica*, Speyer), renovation of alfalfa fields during the winter months is recommended. This will destroy large numbers of the hibernating pupae. Pasturing the fields will also aid in the destruction of the resting stage of this insect. Among the truck crop insects the corn ear worm (*Chloridea obsoleta*) has been reported as causing much damage to tomatoes. The use of an early trap crop, as well as early maturing varieties, the hand-picking of infested tomatoes to prevent the larvae spreading, autumn ploughing of infested ground, and the proper disposal of unsaleable infected tomatoes, will help in the protection of the next year's crop.

Essig (E. O.). **Insect Notes.**—*Mthly Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, p. 705.

*Asterolecanium variolosum* has been reported as working on oak trees at Stackton by F. Maskew. Young pine trees (*Pinus radiata*, Don.) have been seriously damaged by *Ips* (*Tomicus*) *confusus*. A new *Kermes* has been found working on *Quercus agrifolia*, Neé.

Strong (L. A.). **A Fortunate Find.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 709-711, 1 fig.

Examination of "Kamani nuts" (*Terminalia catappa*) brought from Honolulu and destined for planting in Southern California, showed them to be badly infested with living larvae of the Mediterranean fruit fly (*Ceratitis capitata*, Wied.), and they were consequently confiscated. Had this been overlooked the worst known insect pest of fruit and vegetables would probably have been established in California.

Vosler (E. J.). **Zebra Caterpillar (*Mamestra picta*, Harris).**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 11, Nov. 1913, pp. 713-715.

The eggs of this caterpillar are deposited on the alfalfa leaves, and hatch in a few days. The young larvae eat the epidermis of the leaves, which soon appear whitish from their attacks, and they web the tops of the alfalfa stalks together. In the young stages the larvae work in colonies and only on the upper more tender portions of the plant. In an alfalfa field at Salt Lake, Utah, it was noted that in the latter part of September and in the early days of October when the leaves of alfalfa were becoming too tough, the larvae migrated to the edges of the field to feed on the tender growth of dock. From September to October the caterpillars enter the soil to pupate. At present the best method of control for this pest is picking and destroying infested tops. If the fields are pastured at this time of the year little damage will result from this insect's attack. This moth occurs in the Atlantic States, Colorado, Utah, and California. It also attacks cabbage, celery, beets, and other garden vegetables. A species of Tachinid fly and an Ichneumonid (*Campoplex*) have been reared from *M. picta* The *Campoplex* emerges from the larva at about the third stage.

Essig (E. O.). **A Serious Philippine Orange Moth.**—*Mthly. Bull. State Commiss. Hortic., Sacramento,* ii, no. 11, Nov. 1913, pp. 722-723, 1 fig.

The author states that Professor C. F. Baker has called particular attention to a small moth which works in a variety of native orange in the Philippines, called the "cajel." It has been determined as *Prays citri*, Mill., of which *Prays nephelomima*, Meyrick, is a synonym. The larvae of this moth live just beneath the rind next to, but not in, the pulp. They produce gall-like tumours, which are often exceedingly numerous, and which remain open at the tips, affording excellent germinating places for destructive fungi. The opening is usually about one-eighth of an inch in diameter. The danger of the introduction of this moth into California is greatly reduced by the quarantine laws, which are being maintained against all countries where the fruit flies (Trypetidae) are known to exist. The recognition of the pest by quarantine offices may prevent its introduction from some other section of the world where these laws do not apply.

**General Notes.**—*Mthly. Bull. State Commiss. Hortic., Sacramento,* ii, no. 11, Nov. 1913, pp. 724-728, 731.

E. O. Essig notes some of the discoveries of Professor C. F. Baker in the Philippine Islands with regard to fruit flies. The melon maggot, *Dacus cucurbitae*, Coq., is abundant there; and another fly, the maggots of which he found swarming in wild oranges, proved to be a new genus and a new species named by Bezzi, *Monacrostichus citricola*. Professor R. W. Doane has recently collected the Queensland fruit fly, *D. zonatus*, Coq., on the Island of Tahiti. All these fruit flies are serious pests, so these records are of value to the horticultural quarantine departments. E. O. Essig also quotes the formula of a spray for the control of tomato Thrips, devised by R. T. Watson, of the Florida Agricultural Experiment Station, which, on a trial piece, killed 78 per cent. of the Thrips. The mixture consists of commercial lime-sulphur (33° Baumé), 5½ gals.; "Black-leaf 40," 14 fluid ounces; water, 200 gals.

A. J. Cook records the occurrence in California of an as yet undescribed weevil, which was found in large numbers doing no little damage to the tender foliage of apricot trees. The occurrence of a new species in large numbers all at once is difficult to explain. Possibly it is an importation or it may have come from some indigenous wild plant. This new beetle is an Otiorrhynchid allied to Fuller's rose beetle, *Aramigus fulleri*, the larvae of which feed upon the roots of roses, raspberries, blackberries, and other rosaceous plants. It is not known upon what this new pest feeds in the larval stage; the beetle does not appear till midsummer.

C. W. Beers reports a millipede doing considerable damage to the tender roots of vines in Santa Barbara county. B. R. Jones also reports it as doing serious harm to lettuces; it feeds largely on decaying vegetable matter. The dark blue blister beetle, *Cantharis stygica*, Lec., is reported to have done considerable damage to buds and blossoms of asters in Philo, Mendocino County, Cal. The red-humped caterpillar, *Schizura concinna*, S. and A., has been attacking the foliage

of apples, prunes, cherries, pears, and walnuts at Modesto. R. S. Vaile has reared from *Aspidiotus hederae*, Vall., *Aspidiotiphagus citrinus*, Crwf., and *Aphelinus fuscipennis*, Howard. *Chelonus shoshoneanorum*, Vier., has been reared from the potato tuber moth, *Phthorimaea operculella* by H. A. Weinland of San Diego County.

VOSLER (E. J.). **Calendar of Insect Pests and Plant Diseases.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 11, Nov. 1913, pp. 729-730.

The squash bug winters in the adult stage under rubbish and among old vines. Clean culture is therefore an important remedial measure. Insects in stored products, such as the grain weevil, pea weevils, flour moths, etc., are best checked by fumigation with carbon bisulphide. An air-tight fumigating room is an essential. Pour the carbon bisulphide into shallow dishes and place in the bins, using 5 lb. to 1,000 cubic feet of space. The temperature should be 70° Fahr. or above for the best results. Insects in greenhouses, such as red spiders and mealy bugs, are best checked by syringing the plants forcibly with water two or three times a day. The caterpillars of the California tussock moth feed upon young fruit and foliage. This pest spends the winter in the egg stage, the eggs being in masses attached to the trunks of trees and adjacent objects; the hand-picking of egg-masses will greatly reduce their numbers.

BALLARD (E.). **Pests of Stored Grain.**—*Supplement No. 4 to the Nyasaland Government Gazette, Zomba*, xx, no. 12, 29th Nov. 1913, p. 298.

A short account is given of pests of stored grain in Nyasaland, the two chief of which are the Grain Moth (*Sitotroga cerealella*, Ol.), and the Rice Weevil (*Calandra oryzae*, L.). With these is often found another beetle, *Tribolium confusum*, Duv., which, however, does no serious damage. Fumigating with carbon bisulphide is recommended.

FRENCH (C. Jr.). **Insect Pests of the Potato.**—*Jl. Dept. Agric. of Victoria, Melbourne*, xi, pt. 12, Dec. 1913, pp. 729-748, 13 pl.

The dreaded Colorado beetle and a few other pests prevalent in America and elsewhere are absent from Australia, and with the careful inspection and quarantine in Melbourne of all potatoes arriving from abroad, growers have little fear of new pests being introduced. The Potato Thrips, *Thrips tabaci*, Lind., has caused considerable losses, and appears to be on the increase. They attack plants of all kinds. If débris is examined during the winter, they are found in great numbers; the first warm days of October brings them out in thousands, and on the underside of the potato leaves they will be found in varying stages of development. Total development occupies 10–15 days in Victoria. The thrips pest is a serious one, and unless definite measures are taken against it, it will be impossible to grow good crops; the lower leaves of the plant are attacked first and as these are destroyed the top ones are affected in turn. All débris on potato fields should be destroyed; by this means hibernating insects and their eggs will be

eradicated. Various spraying methods have given good results. Mr. G. Seymour and the author used tobacco wash with a Strawsonizer spraying outfit; the formula for the tobacco wash is as follows: Steep 1 lb. of tobacco in 1 gal. hot water, and soak for 24 hours; boil 1 lb. soap in 1 gal. water; strain the tobacco water into the soap water; stir, and make up to 5 or 6 gals. Benzol emulsion, costing about 4d. per lb., has proved effective; 1 lb. makes 5 or 6 gals. of spray. Hellebore or a weak kerosene emulsion has also given good results. In America the use of lime in the following proportions has been recommended: 35 lb. lime to 100 gals. water. Mr. Moulton, who has experimented with thrips in America, advocates the use of oil and water in making up the tobacco spraying fluid, and gives the following formula:—Distillate oil emulsion, 1½ to 2 per cent. solution; black leaf tobacco extract, 1 part to 60 parts of water. The distillate oil emulsion is prepared as follows:—Hot water, 12 gals.; white oil or fish oil soap, 30 lb.; distillate oil (23 degrees, Baumé), 20 gals. The soap is dissolved in a kettleful of boiling water and poured into the spray tank; the oil is added and the mixture agitated violently, and sprayed under a pressure of 125–150 lb. into other barrels. This stock solution is diluted before use with 24 gals. of water to each gallon of solution. As a deterrent against thrips coal-tar water has been recommended. Boil 1 lb. coal-tar in 2 gals. water, and while hot, add from 50 to 100 gals. more water.

Cutworms and looper caterpillars, army worms, etc., have been destructive to potato crops. Especially mentioned are the Silvery Moth (*Plusia argentifera*), the Potato Looper Moth (*P. verticillata*), *Chloridea obsoleta* and *Leucania* sp. By the eradication of weeds and the burning of haulms and stems of harvested crops, many eggs are destroyed. Placing bundles of succulent plants, which have previously been dipped into a mixture of Paris green (1 oz. to 39 gals. of water) between the rows of potato plants will kill a large number of the caterpillars, and is harmless to the potatoes. Poisoned bran has been successfully tried, especially against the Silvery Moth. The author recommends the poisoning of lucerne or other green stuff, to be distributed as a bait. One lb. of arsenate of soda is dissolved in 10 gals. of water, to which 8 lb. of treacle or brown sugar is added; the green stuff is moistened with the liquid and scattered broadcast, preferably a few days after the ground has been ploughed. Where a spray is used instead of bait, arsenate of lead has proved one of the best. The trench system is a simple and effective method of eradication; a trench is dug around the crop, it must have clean cut sides, and the sides nearest the crop should be undercut to prevent the worms from crawling out of the trench. Deep holes should be made in the trench at intervals of about five yards. When travelling towards the crop the cutworms fall into the trench, and crawling along it fall into the holes, where earth should be thrown over them and pressed down.

The Potato Moth (*Phthorimaea solanella*, Boisd.) is the worst potato pest in Australia. The young larvae usually feed upon the eyes of the potato; they then tunnel towards the centre of the tubers, causing them to turn brownish-black, and inducing decay. The pupae are attacked by various parasites and bacterial diseases, which destroy great numbers. All débris in the fields should be burnt. Seed infected with the grubs should never be planted, nor should ground where

affected potatoes have been grown be used again for the same crop. Potatoes should never be left exposed in the field or store-room, but placed at once in bins, pits or any other receptacle where the moths cannot reach them. Trapping by means of lamps is of use in destroying the moths, which fly at night. Spraying the crops, when the moths begin to appear is advisable, as this will destroy the young grubs as soon as they begin to feed. A good arsenical spray is prepared as follows :—Boil 1 lb. white arsenic and 2 lb. carbonate of soda (crystals) in ½ gal. of water for 20 minutes ; separately dissolve 7 lb. arsenate of lead in 1 gal. warm water ; when both mixtures are cold, mix them together. Bottle into twelve 1-pint bottles, and use one bottle to 30 gals. of water. Mix the chemicals in wooden buckets.

The Potato and Tomato Weevil (*Desiantha nociva*, Lea) is a comparatively new pest of the potato. It does considerable damage, and both larvae and adults are equally destructive ; it is a prolific breeder, and every possible means should be taken to prevent its spread. All weeds, especially marshmallows, on land adjoining potato crops should be destroyed. Arsenate of lead spray has been experimentally proved to keep the pest in check.

Jassids, Leafhoppers or Froghoppers are found in large numbers, occasionally doing damage to young leaves and shoots. If the damage bids fair to be serious it would be necessary to spray the crop with benzol emulsion, 1 lb. to 5 gals. of water.

The Rutherglen Bug (*Nysius vinitor*) is one of the most destructive of plant bugs in Victoria. The prevention and remedies are those which are recommended for thrips.

A large number of species of wire worms (ELATERIDAE) are found in Victoria, where however, they do not make much headway, owing no doubt to natural enemies. One of the best methods of keeping wire worms under control is to turn the ground over frequently, exposing the insects to birds. Poisoned baits, made by cutting up a few turnips, carrots, etc., and soaking them in arsenate of lead, have given good results. Manurial insecticides worked into the soil have also been tried with success.

The Victorian White Ant (*Termes lactis*, Froggatt) is a destroyer of timber and furniture, as well as apricot, plum and other fruit trees, vines, potatoes, etc. Although it has so far caused no serious damage to potatoes, it should be watched, and, if the circumstances warrant, all old stumps, etc., which harbour the insect should be removed. Another plan is to dig Vaporite into the soil, which is then pressed firmly down ; the quantity of Vaporite used is generally at the rate of 225 lb. per acre for light soils, and about 350 lb. for heavy soils. Manurial insecticide worked into the soil has given good results.

SYMONS (T. B.) and CORY (E. N.). **Miscellaneous Insect Pests.**—*Maryland Agric. Exper. Sta., College Park, Bull.* 175, March 1913, pp. 171-179. [Received 31st Jan. 1914.]

A formula is given for a lime-sulphur spray against San José scale (*Aspidiotus perniciosus*), and for terrapin scale, (*Lecanium nigrofasciatum*), a standard miscible oil at a strength of 1:15, applied to the tree as late in the spring as possible, is recommended. The woolly apple aphis (*Eriosoma lanigerum*) is stated to be very common in apple

orchards, and of numerous remedies tried, 10 per cent. kerosene emulsion seems to be the most effective against this and other aphids. The loss caused by Hessian Fly (*Mayetiola destructor*) is periodic, but has increased during the last two years in Maryland. When wheat is infested in winter or early spring it is best to pasture sheep in the field, that they may eat the wheat down to the roots. As the insect passes the summer in the wheat stubble, this should be burned over or ploughed under as soon as possible after harvest. Rotation of crops is very beneficial. A list of cities and towns is given and dates *before* which wheat should not be sown in these places. In 1912, alfalfa, corn, millet, lawns and other crops or plants in their vicinity were seriously damaged by the fall army worm (*Laphygma frugiperda*). The larvae can be controlled by the use of poisoned bait spread over the infested area. The pickle worm (*Diaphania nitidalis*) also caused considerable damage to cucumbers, melons, and early and late squashes and pumpkins in 1912. The moth deposits her eggs in the blossoms and the larvae enter the young fruits, where they live until mature. A trap crop, coming into blossom before the main crop, is a valuable method of collecting the eggs and larvae. All rubbish after the crop is taken should be burned. Widespread injury has been done to black locust trees, especially along the Potomac River, by the locust Hispid (*Chalepus dorsalis*). The larvae of this insect feed between the two surfaces of the leaf, where they also pupate. A poison spray of 4 lb. arsenate of lead to 50 gals. water was very effective, and the use of soap in the spray was found to make the solution adhere to the foliage better. Burning over the wood lots in late autumn may prove beneficial. The orange-striped oak worm (*Anisota senatoria*) has caused considerable defoliation of the pin-oaks, and severe injury in some nurseries. Two pounds of arsenate of lead to fifty gallons of water used as a spray will control the pest.

Cory (E. N.). **The Peach-Tree Borer.**—*Maryland Agric. Expt. Sta., College Park, Bull.* 176, April 1913, pp. 181-218, 14 figs. [Received 31st Jan. 1914.]

The peach-tree borer (*Sanninoidea exitiosa*, Say) has been known to horticulturists for over 150 years. It has been found breeding in plum, both wild and cultivated, cherry, June berry, flowering almond, nectarine, apricot, azalea, peach trees and shrubs. Wild cherry is probably the native food-plant. The author gives details of several breeding experiments, and notes that the greatest number of eggs deposited by one moth was 161, the greatest number in one place 47 and of all eggs deposited, 390 were on the leaves and 67 on the trunk. The larvae bore into the trunk, feed all the summer, usually in the cambium, and in the autumn work down below ground level. Those entering the trunk higher up rarely reach maturity, possibly owing to extremes of temperature. The pupal stage lasts about 22–23 days. From the eggs the parasite, *Telenomus quaintancei*, Gir., was reared, while a species of *Bracon* and of *Macrodyctium* have been bred from the pupae.

A table and explanatory notes are given showing numerous control measures tried and their results. The author states that, owing to the habits of oviposition of the moths, mechanical barriers cannot be

recommended ; repellent washes that depend upon their odour for their effect are useless; coatings intended to present physical difficulties to the entrance of the larvae are ineffective ; poison coatings are too readily washed off ; and materials used at the base as repellents are ineffective and in some cases dangerous. Banking earth against the trunks to the height of six inches or more has proved the best practice that can be recommended, as the larvae are thus driven to enter at a higher point than normally would be the case. This facilitates the removal of the larva and reduces the cost. Extracting the larvae is certainly effective and when done carefully need not injure the trees. This should be done with a sharp knife and a light wire ending in a small hook ; with this the larvae can often be drawn from the burrow. The trees should be " wormed " as late in the autumn as practicable and again in May. To facilitate the work the earth should be drawn away from the trunks to a depth of six inches and the root crowns scraped at least one day before the " worming " is begun. The paper concludes with a lengthy bibliography.

Davis (J. J.). **Common white-grubs.**—*U.S. Dept. Agric., Washington, Farmers' Bull.* 543, 18th July 1913, 20 pp. 12 figs. [Received 5th Feb. 1914.]

The most serious outbreak of white grubs (*Lachnosterna*) recorded in the States occurred in 1912, when over 12 million dollars worth of damage was done, mostly in Iowa, Wisconsin, Illinois, Pennsylvania, New York, Connecticut and New Jersey. Available records show that May beetles were unusually abundant in 1908, the grubs causing considerable damage in Wisconsin, Illinois, etc. in 1909, and yet more in 1912. The beetles were very numerous in the spring of 1911, thus giving rather conclusive evidence that the life-cycle of the more abundant and numerous species in those localities is uniformly three years. It is, therefore, reasonably certain that in 1914 the beetles will again be unusually plentiful, and the year following (1915) the grubs will be exceedingly abundant and destructive if uncontrolled, either naturally or artificially. The grubs do the greatest amount of damage in their second year and to the early plantings in their third year. From all observations small grains are less attacked than are corn, timothy, strawberries and potatoes. It is important that the grubs of May beetles should not be confused with similar but non-injurious grubs, or with others which may be injurious but require different methods of control. The grubs of May beetles are not known to breed in manure or refuse of any kind ; those generally found in such places being the immature forms of certain brown beetles (*Ligyrus gibbosus*, de G., and *L. relictus*, Say) which frequent light in the same manner as the May beetle. The white grubs and May beetles are preyed upon by numerous enemies, the most important being birds, in the stomachs of 60 species of which the Biological Survey has found these insects. Crows and crow blackbirds are particularly useful, and an instance is given when one of the latter destroyed in all 20 grubs in about one or two minutes. The skunk is probably the most valuable of undomesticated mammals, so that farmers have begun to protect it. Of predaceous and parasitic insects the black digger wasp (*Tiphia inornata*, Say), another wasp (*Elis sexcincta*), and a fly (*Pyrgota undata*)

appear the most beneficial. The knowledge of the several fungous and bacterial diseases reported as attacking the grubs and beetles is as yet superficial and their value for this purpose is still an open question. The author states that all general measures of control recommended are preventive rather than remedial, for once white grubs are present the crop cannot be protected from their ravages. But certain cultural and other practices will greatly minimise the damage in succeeding years. Domestic fowls should be given the run of infested fields, especially when the land is being ploughed. Hogs will thoroughly clear an infested field if pastured on it any time between April and October. They are very fond of grubs and root to a depth of a foot or more in search of them ; but in winter the grubs go much deeper and thus escape destruction. It should be noted that the giant thorn-headed worm, *Echinorynchus gigas*, an intestinal worm attacking swine, passes one of the early stages of its life within the white grub, which has been infested through the excrement of infested swine. In this connection Dr. S. A. Forbes says : " Pigs which have never been pastured are certain to be free from these parasites, and grubs growing in fields which have not been pastured by pigs are likewise certain to be free from them. The use of such pigs on such fields would consequently be without danger from this source, and a little attention to these facts will avoid any injurious consequences. That is, if pigs not previously allowed to run out are turned into fields on which pigs have not been pastured within three years, there will be no danger that they will become infested by these thorn-headed worms." During the years of great abundance of the beetles, hogs should be turned into orchards and timber lots during the period of flight and will eagerly seek them out, just beneath the surface of the soil or near trees where they pass the day. Autumn ploughing is very useful. Ordinarily the best time is between 1st and 15th October, as later on the grubs go too far down. The rotation of crops is also very useful, and since the eggs are usually deposited in fields of grass, timothy, and small grains it is evident that such crops as buckwheat, clover, alfalfa, and peas should be planted in the year following a season of beetle abundance. Collection of the beetles is effective where whole communities or neighbourhoods co-operate in the work. It is in the early morning, before 4.30 a.m., that the beetles are most easily shaken off the trees, and each female destroyed early in the season means the destruction of from 50 to 100 potential grubs. Where it is possible to secure cheap labour, collecting the grubs in the wake of the plough is practicable, especially where they are numerous. Light traps are not satisfactory as they attract hardly any female beetles. Spraying with Paris green or lead arsenate is effective, but usually impracticable owing to the large size of the trees upon which the beetles feed. With a more definite knowledge of the food-plants preferred, low-growing trees and shrubs might be planted as traps where the beetles could be sprayed.

No reliable remedy can be offered for the destruction of grubs in lawns ; but poultry, especially turkeys, might be allowed to run on them. Hogs would tear up the roots. Perhaps removal of the sods, collection of the grubs, and, later, autumn ploughing, will prove satisfactory. In cases of mild infestation a commercial fertiliser will probably assist the grass in overcoming the grub injury. Dealing

with *Melolontha* in Europe, Decoppet injected carbon bisulphide into the soil at a depth not exceeding six inches, at the rate of 1 to 1½ ounces in 6 or 8 holes per square yard, and this has been found to diminish the number of grubs considerably. Excellent results are obtained by this means against those of the southern green June beetle in the lawns of the Southern States, and it is probable that this method will prove successful with the white grub in lawns. The holes should be plugged with soil or sod to prevent the fumes escaping, and it must be remembered that carbon bisulphide is highly inflammable and forms an explosive compound when mixed with air.

GASTINE (G.). *Diaspis pentagona* (**Cochenille du Murier**). [The mulberry scale.]—*Librairie agricole de la Maison Rustique, Paris*, N.D., 45 pp., 9 figs; price 30 centimes.

This is one of a series of popular booklets, each treating of a single subject and written by a specialist. The author points out that the scale-insects and aphids may be considered the most dangerous agricultural pests known, and as through the agency of its agile larvae *Diaspis pentagona* spreads quickly afar, the greatest energy must be employed against it. In its country of origin, the Japanese regard this scale as the worst enemy of the mulberry and other fruit trees, and its rapid dispersal throughout the world is due to shipments of infested plants on which the insect defies the most unfavourable conditions; for it can survive extreme cold and even dessicated fragments of a twig suffice for its subsistence. The author suggests that the destruction by fire of any infested plants imported into a clean country is the only safe measure. Should this be impracticable, scrubbing with wire brushes followed by the burning of all the débris and the thorough application of an insecticide is the best method, the solution being sprayed on the branches and brushed into the bark of the trunk and larger branches. The latest formulae officially advised in Italy are: (1) A. heavy coal-tar oil 22 oz., crude oil of turpentine 2¼ oz., B. common sea-salt 22 oz., wheat flour ¼ oz., water 2 gallons; (2) A. crude petroleum 22 oz., ordinary fish oil 2¼ oz., crude oil of turpentine 1½ oz., B. common salt 22 oz., wheat flour ½ oz., water 2 gallons; (3) A. mixture of mineral oils (density 1·05), called Eusol in Italy, 22 oz., B. common salt 3 oz., wheat flour ¼ oz., water 2 gallons. To prepare any of these the salt is dissolved in the water and the flour mixed in. The oily mixture A, already prepared, is gradually added with very energetic stirring in order to obtain a homogeneous solution. As the component parts tend to separate very readily the author suggests the use of Saponin, which produces permanent emulsions easily. Saponin is not obtainable commercially, but many vegetable products contain this substance, the fruit of *Sapindus utilis* being richest in it. Saponin represents about 50 per cent. of the pericarp, which itself is about 68½ per cent. of the total fruit, and as it dissolves out in water the pericarp may be conveniently employed for the purpose. The author gives four formulae: (1) A., heavy coal-tar oil 2 lb., B. saponin solution obtained by extracting 1 oz. of Sapindus pericarp in 2 gals. of water; (2) petroleum oil or crude petroleum 2 lb., B. saponin solution as above; (3) homogeneous emulsion—A., clear heavy coal-tar oil (density 1045) 20 oz., medium coal-tar oil (density 950) 12¼ oz.,

B. saponin solution as above; (4) homogeneous emulsion—A. clear heavy coal-tar oil (density 1045) $28\frac{1}{4}$ oz., petroleum (density ·800) $4\frac{1}{4}$ oz; B. saponin solution as above. To prepare solution B., Sapindus pericarp (1 oz.) is boiled for a few minutes in water (1 pint taken from the 2 gallons) and when sufficiently soft it is mashed to facilitate solution of the saponin. This preparation is passed through a No. 65 (French) sieve, as the insoluble particles would clog the sprayer. To extract all the saponin this insoluble residue is placed in the remaining 15 pints of water and again strained out. Into the saponin solution (B) the oily mixture (A) is gradually poured with energetic mixing, when the fine oil globules will remain in suspension. [Cf. this *Review*, A, i, p. 238.] If the oily mixture is heavier than the water it will sink, if lighter, it will float, but the slightest shake will cause uniform admixture; with equal densities the emulsion is permanently homogeneous. The author points out that though his formulae are stronger than the Italian ones, yet owing to the perfect emulsification the shoots are in less danger of being harmed. All the foregoing sprays are for winter use. Should it be desirable to follow up the treatment by spring and summer applications, the percentage of the coal-tar and petroleum oils must be reduced to 1·5 per cent. or 2 per cent. at the most, as otherwise damage will be done. Either the saponin solution may be used, or $1\frac{1}{2}$ oz. of white soap dissolved in the 2 gals. of water when the latter is at boiling point; soft soap contains too many impurities. The insecticide is used as a spray and the first application made when the young larvae appear, is followed by a second at 10 days' interval. The men must be protected by gloves and masks with glazed eye-holes.

The author mentions *Prospaltella berlesei*, a small Chalcid fly now being tested in many parts of Italy and which Berlese hopes will check *D. pentagona*. Other parasites are being studied in Italy, especially by Silvestri. But at the present time direct methods of control are the only ones in real use. The author concludes by giving a list of some 50 different trees and plants affected by the pest and remarks that this list can be added to daily.

Henrich (C.). **Die Blattläuse Aphiden der Umgebung von Hermannstadt.** [Aphid plant lice in the neighbourhood of Hermannstadt.]—*Verh. und Mitt. Siebenbürgischen Ver. Naturwiss. zu Hermannstadt*, lxiii, no. 6, 1913, pp. 195-201.

The present paper forms a supplement to one published by the author on Aphids in 1909. Since then some additional species have been discovered by him in the environs of Hermannstadt, among which are: *Mindarus abietinus*, Koch, on *Abies pectinata; Pemphigus piriformis*, Licht., *P. bursarius*, L., *P. borealis*, Tullgren, and *P. Lichtensteini*, Tullgren, all on *Populus pyramidalis* and *P. nigra;* and *Phylloxera acanthochermes*, Lichtst., on oak.

Sulc (K.). **Zur Kenntnis einiger Psylla-Arten aus dem Ungarischen National Museum in Budapest.** [On some species of *Psylla* from the Hungarian National Museum.]—*Ann. Mus. Nat. Hungarici, Budapest*, xi, pt. 2, 1913, pp. 409-435.

Seven species of the genus *Psylla* are described from specimens in a

collection from the Hungarian National Museum. Two species are new, namely *P. groenlandica* and *P. horvathi* the former from Greenland and the latter from Hungary ; their life-history and habits are as yet unknown. The species *P. hexastigma*, Horvath, is of economic interest, as it attacks the leaves and fruit of the pear ; its larva is unknown. It occurs in Eastern Siberia and Japan.

**Sur l'emploi des arsenicaux en agriculture.** [The use of arsenicals in agriculture].—*Bull. Agric. de l'Algérie et de la Tunisie, Algiers*, xix, no. 19, 1st Oct. 1913, pp. 378-380.

The *Commission des Substances vénéneuses* has handed to the Académie de Médecine, Paris, their new report on a long-delayed regulation to modify that of 1846 regarding the use of poisons. Part of the report deals with arsenicals used in agriculture. Subject to safeguards the Académie authorised, in 1910, the use of the potent but dangerous arsenical insecticides, with the exception of lead arsenate, which had just begun to be employed. Its use is now general, as a consequence of its very valuable properties, and it was necessary to decide whether to prohibit it, or to permit it under specified rules. The report recommends the latter course, pointing out that the U.S. Minister of Agriculture specially advises lead arsenate in preference to other insecticides, so that the French markets will be flooded with foreign produce if the French agriculturist is not provided with weapons equal to those of his rivals. Regarding the sale and use of arsenicals, especially lead arsenate, the Report expresses the following desiderata—(1) That the regulations be strictly observed ; (2) that the Ministerial decrees determining the precautions to be taken by users of the products and the conditions under which they may be used, be clearly and minutely detailed, billed everywhere, and brought to public notice, and any infringement severely punished ; all this to be especially applicable to lead arsenate ; (3) that the Government initiate and encourage research, with the object of replacing such dangerous insecticides by methods harmless to man and domestic animals.

In order to prevent food-plants being wetted by drippings from trees and vines above them, the Commission propose to introduce a clause formally prohibiting the use of arsenicals (or other insecticides of Table A of the regulations) for market-gardens and fodder plants.

Cros (A.). **La Mouche de l'Olivier.** [The Olive Fly.]—*Bull. Agric. de l'Algérie et de la Tunisie, Algiers*, xix, no. 22, 15th Nov. 1913, pp. 467-468.

Early in 1913 the author drew attention to the enormous proportion of olives in the neighbourhood of Mascara (Oran, Algeria) attacked by *Dacus oleae* and the presence at the same time of a small Ichneumonid. He made a special study of both insects on a completely isolated olive tree which was not treated in any way against the pest in 1912. In that year not a single sound olive was obtained, but in September 1913, though the tree bore well, there was no sign whatever of attack by the fly. He attributes this to the activity of the parasite, and remarks that had the tree been sprayed, the good results would have been attributed to the spray and not to the parasite. The author is not altogether satisfied that spraying *per se* is entitled to the great credit it has obtained.

•MacGillivray (A. D.). **The Immature Stages of the Tenthredinoidea.**—*Canadian Entomologist*, xlv, no. 11, Nov. 1913, pp. 367-371.

A general account of the larval habits of the various families of sawflies.

Mackie (D. B.). **The Philippine Locust** (*Pachytylus* [*Locusta*] *migratoroides*, R. & F.) ; **Natural Influences affecting its Propagation and Distribution.**—*Philippine Agric. Review, Manila*, vi, no. 11, 1913, pp. 538-547, 2 pls.

The chief forces which operate for or against any species may be stated as climate, food supply and enemies. Climatic influences exert the greatest check on locusts. Cold weather causes them to hibernate for extended periods, though this is seldom the case in the Philippines. Winds are important in locust distribution and control. Moderate winds often enable swarms to make long, sustained flights, even crossing from island to island, as from Cebu to Negros. High winds tend to keep locusts near the ground and to prevent extended flights, and severe winds often work great havoc with locust swarms, at times completely annihilating them. Locusts seldom fly during rains. The results of a typhoon are often disastrous to the swarm, the locusts being killed in large numbers by the vegetation being whipped about by the high winds, while the wings of the adults are often torn to such an extent that further flight is impossible, so that the females are forced to lay their eggs on unsuitable ground, which results in a low percentage of them hatching. Floods are important as locust destroyers, especially when large areas on which locusts have oviposited become flooded and quantities of silt deposited over the eggs which effectually prevents the hoppers from emerging. Drought seems to exert a powerful influence in the increase of the pest, since dry weather is inimical to locust parasites. Drought may also induce migrations. Lack of food might also cause the migratory instinct to assert itself. Locust enemies may be classed as predators, parasites and diseases. The importance of birds as locust exterminators cannot be too strongly emphasised; and numerous mammals, reptiles, frogs, etc. and predatory insects attack almost entirely the immature insects and eggs. Of the flies present in the Philippines, the Dexinae have never been bred out, but have been noted in the vicinity of swarms. The Sarcophaginae are known to parasitise both the mature and young locusts. Two species of Nematodes, or hair-worms, representing the two genera *Gordius* and *Mermis* have been found in the Philippine locusts, the former breeding in water, while the latter is terrestrial. The eggs are deposited in water or on the ground and the young crawl up the vegetation, reaching the host through the mouth with food, and undergoing transformation in the body cavity of the locust. These parasites are probably of little economic importance as locust destroyers. The red locust mites, so far as is known, are no great inconvenience to their hosts. The possibility of controlling locusts through the agency of parasites is very remote since the percentage of parasitised individuals is small. The fungous disease due to *Empusa grylli* has been known to infect locusts, but it is impossible to cultivate this fungus with much success artificially and communicate it to locust swarms. Experiments to test the effect of *Coccobacillus acridiorum*, D'Herelle,

were made, and cultures brought to their maximum virulence in the laboratory were introduced on a swarm of half-grown locusts. The results were practically nil and the contagion did not spread.

**Stand der Reblausbekämpfung im Jahre 1912 in den Kantonen Zürich und Thurgau.** [Phylloxera control in the cantons of Zürich and Thurgau in 1912.]—*Schweiz. Zeits. Obst- und Weinbau, Frauenfeld,* no. 22, 24th Nov. 1913, pp. 349-350.

In 26 communes 4,781 infected stocks were noticed in 247 new points. Five permits were granted to replant previously infected areas with 745 native stocks and two permits for 443 were refused. Twenty-five proprietors renounced re-planting on payment of a lump sum. Replanting with grafts on American stocks is allowed after an interval of at least four years, or eight years in the case of native stocks. As a trial, nurseries for grafted vines were established at Steinmaur and Dielsdorf. In the latter place two new experimental plots were planted with grafted vines. This brings the number of Zürich plots up to 26, all in an average good condition, and the material for these was supplied by the Swiss Experiment Station at Wädenswil. In spite of the vine tax, the vine fund has fallen from £5,218 to £5,055. From 1886 to 1912, 731,895 stocks on an area of about 125,000 acres were destroyed in the Canton of Zürich, and the costs were as follows:—Wages, £31,189; Chemicals, £6,563; compensation, £33,971; other expenses, £10,522. The total cost was £82,246. A portion of the cleared land has again been planted with vines, partly as experimental plots with grafted stocks, and partly with native stocks.

The Canton of Thurgau report mentions 333 infected stocks at 59 points. Proprietors were paid £71 compensation for the destruction of 2,591 stocks on an area of half an acre. In 1912, no infection was noticed in the communes of Landschlacht, Gachnang, Aadorf and Altnau. The campaign was begun in 1897 and up to 1912 a total of 440,844 stocks had been destroyed and the proprietors paid £1,574 for the grapes and £5,274 for the stocks. The report does not give any other figures. Five experimental plots of grafted vines have been planted in the former Phylloxera centres.

J. D. **Zum diesjährigen Mottenflug.** [The vine-moth flight in 1913.]—*Luxemburger Weinztng., Grevenmacher,* i, no. 30, 15 Nov. 1913, pp. 517-518.

Experiments lasting from 10th July to 30th August were conducted by Herr Fixmer of Grevenmacher, who found that the flight took place from 18th July to 29th August, thus occupying no less than 43 days. Four beer-traps were used. A total of 1,393 moths were captured, or 348 per trap. According to these figures the system of trapping is a profitable one. The largest number taken was 112, on the 28th July. The great variation in the numbers caught daily does not allow of a useful average being struck and cannot be accounted for. It is hoped that next time the figures will be completed by notes on the weather conditions prevailing. Such experiments are a valuable aid in determining the proper time for beginning control measures.

KRÄNZLING. *Acheta morio,* **ein Sisalschädling.** [*Acheta morio* as a Sisal pest.]—*Der Pflanzer, Dar-es-Salaam,* ix, no. 11, Nov. 1913, pp. 568-570.

In inspecting a new Sisal plantation it was seen that a number of healthy one-year-old plants were injured in a peculiar manner not previously observed. At their junction with the stem—and sometimes on their spread—the lowest leaves were eaten into holes about as large as the thumb-nail. Some leaves had been entirely detached while others hung suspended by a few strips. The injury was done by night, and only occurred on those plants growing on ground with a cracked and broken surface. A night-visit to the fields showed the pest to be a cricket, *Acheta morio.* Only young specimens, measuring from 1 cm. to 1·5 cm. in length, were noticed at work, as the older ones escaped on the least alarm. The largest caught measured about 3 cm. Cotton, which was planted in between the sisal, had not been touched. This is only the second insect which has been observed to attack sisal. The author remarks that this occurrence of the insect was quite local and simply due to the favourable conditions provided by the broken soil. In case the pest spreads and causes further damage control will be necessary, but it should be neither difficult nor costly.

BOUVIER (E. L.). **Coccinelles contre Cochenilles.** [Coccinellids to combat Coccids.]—*Revue Scientifique, Paris,* 29th Nov. 1913, pp. 673-677.

The author gives in outline an account of the work done by Riley in combating the Coccid, *Icerya purchasi,* in California by means of the ladybird, *Novius cardinalis,* and of the more recent work carried out on the same lines in Italy by Silvestri and Berlese, who have reared parasites of the Coccid, *Diaspis pentagona.* Of several parasites reared, the two most effective seem to be *Prospaltella berlesei,* bred by Berlese, and *Rhizobius lophantae,* reared by Silvestri. The two entomologists are not agreed as to which of these will prove of most use in combating *Diaspis.* Without entering into the discussion of this question, the author records that twigs of mulberry infested with *Diaspis,* which was itself attacked by *Prospaltella,* were submitted to him, and that he found the degree of parasitism to be very high, a fact which speaks in favour of the efficacy of *Prospaltella.* In Nice and eastward to Vintimiglia mulberry trees are attacked by *Diaspis.* Artificial methods of control are held by the author to be only of temporary use, and he thinks that to keep the pest really under control, there is no better way than to introduce its natural enemies.

GURNEY (W. B.). **Ironbark Foliage destroyed by Insects.**—*Agric. Gaz. N.S.W., Sydney,* xxiv, pt. 12, Dec. 1913, p 1076.

Ironbark leaves in Stroud were found to be affected by "Lerp" Insects (PSYLLIDAE), which attack also Eucalyptus trees, sucking the sap. They construct shell-like coverings called "Lerps," under which they grow; after several moults they appear as minute four-winged insects, which lay their eggs on the leaves, on which fresh broods soon hatch. When plentiful they destroy the bulk of the foliage, but usually they are prevalent in numbers which only cause temporary damage. They are kept in check by their natural parasites, minute Chalcid wasps.

## NOTICES.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

## CONTENTS.



(C11.)

VOL. II. Ser. A. Part 3.—pp. 129-200. MARCH, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.

THE EARL OF CROMER, G.C.B., O.M., G.C.M.G., *Chairman.*

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. AUSTEN, Entomological Department, British Museum (Natural History).
Dr. A. G. BAGSHAWE, Director, Tropical Diseases Bureau.
Sir J. ROSE BRADFORD, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., A.M.S.
Dr. S. F. HARMER, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.
The Hon. Sir JOHN McCALL, M.D., Agent-General for Tasmania.
Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.
Sir JOHN McFADYEAN, Principal, Royal Veterinary College, Camden Town.
Sir PATRICK MANSON, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. F. H. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir DAVID PRAIN, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. READ, C.M.G., Colonial Office.
The Honourable N. C. ROTHSCHILD.
Mr. HUGH SCOTT, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. SHIPLEY, F.R.S., Master of Christ's College, Cambridge.
Sir STEWART STOCKMAN, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. THEOBALD, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. J. A. C. TILLEY, Foreign Office.
Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

**General Secretary.**
Mr. A. C. C. PARKINSON (Colonial Office).

**Director and Editor.**
Mr. GUY A. K. MARSHALL.

**Assistant Editor.**
Mr. W. NORTH.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

Rolfs (P. H.) and Fawcett (H. S.). **Fungus Diseases of Scale-Insects and Whitefly.**—*Florida Univ. Agric. Expt. Sta., Gainesville, Bull.* No. 119, Nov. 1913, pp. 71-82, 20 figs.

In Florida, fungus diseases have been employed to a very large extent to combat insect pests, for owing to an abundant rainfall and moist atmosphere, the climate is especially favourable to the development of such fungi. These diseases of scale-insects and whitefly are native to Florida, the fungi appearing spontaneously in widely separated orchards. The fungi do not attack trees, and having destroyed the scale-insects or other pests, perish. Careful observation is required in order to find out where the insects are most numerous and to introduce the fungi in the best positions. For small and badly infested trees spraying with some contact insecticide is recommended to relieve the condition temporarily. The fungi may be bought from F. P. Henderson, Gainesville, Fla.; F. Stirling, De Land, Fla.; S. L. Story, Eutis, Fla., the cost in general being from one to three dollars per acre of trees to be treated. Among the fungi-producing diseases, the red-headed fungus (*Sphaerostilbe coccophila*, Tul.) is known to affect a large number of scale-insects. The method of applying the fungus is to tie a piece of fungus-bearing material on a portion of the tree most severely attacked. A dozen pieces or more should be used in every tree according to the degree of infection, and the fungus placed so that it is shaded from the direct rays of the sun. This fungus has been successfully applied by the spore-spraying method. One or two hundred pustules, each of which contain thousands of spores, to the gallon of water would seem efficient for spraying. The white-headed fungus (*Ophionectria coccicola*, E. and E.) seems more effective in citrus orchards in checking the long scale and the purple scale than does the red-headed fungus. The method of application is the same as for the red-headed fungus. Occurring in all parts of the State and having a very general distribution in Florida is the black fungus (*Myriangium duriaei*, Mont.) especially useful in destroying the chaff-scale (*Parlatoria pergandii*). Here again a small sprig with the fungus should be tied to the scale-infested portion of the tree. This fungus is slow in killing the scales but the eradication is generally perfect. The red fungus (*Aschersonia aleurodis*) of the white fly has been applied with great success by the spore-spraying method. From 25 to 50 leaves, having an abundance of pustules on them, are allowed to soak from five to ten minutes in a pail of water, being stirred occasionally. The mixture is strained and applied to the under sides of the leaves. The yellow fungus (*Aschersonia flavocitrina*) of the whitefly is useful only in combating *Aleurodes nubifera* and is applied by spraying; but the brown fungus (*Aegerita webberi*, Fawcett) of the whitefly has been employed with extremely satisfactory results. The cinnamon fungus (*Verticillium heterocladum*) is not very important as a check to scale-insects.

Watson (J. R.). **Preserving Fungus Parasites of Whitefly.**—*Florida Univ. Agric. Expt. Sta., Gainesville, Press Bull.* No. 217, 29th Nov. 1913, 1 p.

Citrus-growers should be supplied with plenty of red and brown parasitic fungi at the beginning of the rainy season in June, when

however, fungus material is often scarce. When plentiful, as in November, the grower should lay in a supply for use in the next summer. For this purpose a quantity of leaves are collected, allowed to dry for a day or two, and then put in a tight tin box which is to be kept in a cold storage room where the temperature is usually below 40° F., or in a refrigerator. In some circumstances this fungus material may be dried and kept in a dry condition without losing its power to germinate. In the Experiment Station leaves of red fungus were collected in December, allowed to dry, piled loosely in an open box and kept till July. They were then used to spray the trees and the results were as good as those from spraying with material kept in cold storage.

Hood (J. D.). **On a Collection of Thysanoptera from Porto Rico.** —*Insecutor Inscitiae Menstruus, Washington*, i, no. 12, Dec. 1913, pp. 149-154, 1 pl.

The collection of Thysanoptera reported upon by the author contained seven species; it was made by the late Dr. C. W. Hooker in the immediate neighbourhood of Mayagüez, Porto Rico. Six of the species described are recorded for the first time from the island; one species is new and a new genus has been made for it, namely, *Dinurothrips hookeri*. The following species were taken on cultivated plants:—*Heliothrips haemorrhoidalis* on cacao, *Frankliniella tritici* on orange blossom, *Selenothrips rubrocinctus* on cacao and *Gynaikothrips uzeli* on tobacco.

Melle (H. A.). **Lucerne** (*Medicago sativa.*)—*Agric. Journ. Union S. Africa, Pretoria*, vi, no. 6, Dec. 1913, pp. 950-960.

In this paper the author gives the history of this plant from the seed-bed to the market. He notes that one of the great enemies of lucerne at Vryburg is the lucerne caterpillar (*Colias electra*). The perfect insect is a yellow butterfly, the larva being a smooth green caterpillar that feeds ravenously on lucerne and will play havoc with a crop. Lounsbury recommends for the eradication of this pest the cutting of the lucerne when the damage threatens to be great. If lucerne is under irrigation a good method is to flood it continuously, by which means the "caterpillar wilt disease" will be induced amongst the larvae.

Guénaux (G.). **Les Maladies des Chrysanthèmes.** [Diseases of Chrysanthemums.]—*La Vie Agricole et Rurale, Paris*, ii, no. 51, 22nd Nov. 1913, p. 667.

A fly, *Phytomyza geniculata*, lays its eggs in the leaves, the larvae forming mines in the parenchyma. The attacked leaves should be picked off and burned, and the plants treated with a 1 per cent. solution of tobacco juice; they should be sprayed every fortnight subsequently with a 5 per cent. solution. The male of *Calocoris chenopodii*, an Hemipteron, sucks the buds, and the female lays her eggs in the young leaf-and flower-buds. The treatment recommended is spraying with 1 per cent. solutions of tobacco juice, followed by applications of sulphur to the young shoots and buds. Repeat these operations every

fortnight from May to September. *Aphrophora alni*, a froghopper, is very common in summer and lays its eggs in large numbers on the green parts and sometimes on the flowers. The larvae suck the juices of the leaves. This pest is treated in the same way as *Calocoris chenopodii*, but operations ought to be commenced in March. The caterpillars of *Grapholita minutana* eat the collar of the young chrysanthemums and the young shoots, and bore into the flower-buds; the treatment is the same as for *C. chenopodii*. Any flower-buds found to be occupied and deformed by a larva should be picked off and burned.

Csörgey (T.). **Studien über den Vogelschutz im Jahre 1913.** [Bird protection in 1913.]—*Aquila, Budapest*, xx, 1913, pp. 476-502, 6 figs.

The author suggests the pruning of those hedges in which it is wished to shelter birds that only feel safe in bushes where thick cover extends right down to the ground. Instead of pruning so as to obtain a square top and vertical sides, the base of the hedge should be wider than the top so as to allow plenty of light to reach the leaves closest to the ground and promote their growth.

To prevent cats from reaching bird-boxes placed on tree-trunks, barbed wire is wound in a spiral five or six times round the trunk beneath the box. In order that the wire may stand off the trunk it is nailed on small wood blocks about 2 inches thick and the nail driven through such a block can only penetrate the bark and does not do any great harm to the tree.

It is pointed out that bird protection costs very much less than collecting caterpillars, and in spite of most careful collecting the trees are often stripped. In Hungary the aid of the schoolmasters is enlisted in order that the children may learn to understand the usefulness of birds in the economy of agriculture.

Rohwer (S. A.). **Descriptions of New Parasitic Hymenoptera.**—*Proc. Entom. Soc., Washington*, xv, Dec. 1913, pp. 180-188, 1 fig.

Seven new species of parasitic Hymenoptera belonging to the families Ichneumonidae and Braconidae are described so that names will be available for species which have proved of economic importance in helping in the control of injurious insects.

Cushman (R. A.). **Biological Notes on a few rare or little known Parasitic Hymenoptera.**—*Proc. Entom. Soc., Washington*, xv, no. 4, Dec. 1913, pp. 153-160, 2 figs.

*Perilitus americanus*, Riley, a Braconid parasite of lady-birds was very abundant in Vienna, Virginia, in the autumn of 1912; but although a number of other species of Coccinellidae were present, none but the species *Megilla maculata* and single specimens of *Hippodamia convergens* were parasitised by *P. americanus*. In experiments in the laboratory an adult female *Perilitus* was given access to various species of Coccinellids, including *Adalia bipunctata*, *Anatis* 15-*punctata*, *Hippodamia glacialis*, *H. convergens*, *Coccinella* 9-*notata*, *Megilla maculata*, *Cycloneda sanguinea* (=*munda*), and *Hyperaspis* sp., as well as a number of undetermined larvae. All

these were found to be parasitised except *Hyperaspis* sp. The larvae were attacked at any point, while the adults seemed to be attacked only between the segments. The parasite, before ovipositing, perceives the presence of the beetles from a distance of at least an inch, when she shows great excitement by rapid vibration of the antennae and quick movement towards the beetle, then rushing in and giving a quick thrust with her ovipositor. It is probable that the parasite hibernates as a larva within the host.

*Paniscus geminatus*, Say, was found as an external parasite on an undetermined Lepidopterous larva found under a band on an apple tree.

The Chalcid, *Sphaeropyx bicolor*, Cress., was frequently taken in immature stages as a parasite of *Acronycta clarescens*, Guen. This parasite is gregarious, as many as 30 having been reared from a single host. The total period from the emergence of the larva from the host to the issue of the adult is 20–21 days. From some hosts only males were reared, and from others only females, but from the majority parasites of both sexes emerged, the males issuing one or two days ahead of the females. From 22 hosts there were reared 296 females and 86 males. The parasite hibernates as a larva within its cocoon; frequently it is attacked in the cocoon by an omnivorous hyper-parasite, *Dibrachys boucheanus*, Ratz., but it is seldom that all the cocoons in a mass are parasitised. Some eggs of two species of *Acronycta*, one of which feeds on wild cherry, and the other on pear, were exposed to *S. bicolor*; while the parasites took no notice of the eggs, they showed great excitement when on leaves bearing eggs, running rapidly about, dragging their ovipositors over the surface of the leaf and searching minutely with their antennae. No such excitement was shown when uninfested leaves were supplied, a fact suggesting that the search for hosts may possibly be guided somewhat by the scent left by the parent moth on the leaves on which she oviposits. A few days later the *Acronycta* eggs hatched, and the larvae were exposed to the parasites, and were immediately attacked. Older larvae were never touched.

Busck (A.). **Note on a Bark-mining Lepidopteron of the genus *Marmara*, Clemens.**—*Proc. Entom. Soc., Washington*, xv, no. 4, Dec. 1913. pp. 150-151.

In the course of work on forest Lepidoptera the author has bred several specimens of *Marmara fulgidella*, Clemens, from oak. The larva of this insect forms long winding galleries just under the epidermis of young trunks and branches of oak, and leaves the mine early in the spring to spin a small cocoon in some crack in the bark. Similar *Marmara* mines were found less commonly on chestnut; the imago was not secured, but it is thought that it may prove to be the same species or one of the allied forms, *fascilla*, Chmb., or *elotella*, Busck, at present listed under the genus *Gracilaria*.

Knowles (C. H.). **A Report on Scale-Insects found on Bananas in Taviuni.**—*Dept. Agric. Fiji, Suva, Pamphlet* no. 1, 18th July 1913, 3 pp. [Received 19th Feb. 1914.]

As a result of a visit to Taviuni to inquire into the outbreak of scale-insects on bananas in that island the author reports that he came

across no examples of the transparent coconut scale, *Aspidiotus destructor*, but that at least five species of scale-insects were observed on bananas, two of which were also found on coconuts. Most of the coconut estates have bananas growing for food purposes, but the author considers that the cultivation of bananas on Taviuni and particularly among coconuts is attended with very serious risk to the coconut industry. It is stated that plantations of bananas at intervals along the coast provide an extensive area in which the transparent coconut scale might become established, should it ever be introduced into the island, and the present growers should be urged to discontinue the cultivation of bananas. A bunch of bananas infected very plentifully with *A. destructor* was noticed on board ship at Levuka, and the attention of the agent has since been called to the matter and he has promised to give instructions regarding such scaly fruit. The conditions under which bananas are grown are more favourable to the rapid spread of scale-insects than is the case with coconuts. The outbreak of scale in Taviuni and the possibility of the introduction of the transparent scale there, are strong arguments in favour of the early introduction of regulations for compulsory spraying of bananas and for controlling the transport of fruit or plants from areas in which the scale is plentiful. *A. destructor*, which is common on bananas on Vitilevu, is a serious coconut pest in some places, and a menace to the coconut industry, and every effort should be made to eradicate the insect or at any rate to check its spread, particularly to coconut areas. Specimens of all the scales are being sent to England for identification.

Lewton-Brain (L.). **Agriculture in Malaya in 1912.**—*Dept. Agric. Fed. Malay States, Kuala Lumpur, Bull.* no. 18, Oct. 1913, pp. 1-45, 7 tables.

In an account of agriculture in general in Malaya during the year 1912, reference is made to the insect pests of the various cultivated plants. Of the pests of rubber it is stated that on the whole no great damage was done, and that the rubber tree, *Hevea braziliensis*, is generally only attacked by insects when it is weakened by bad treatment or fungus. A mealy-bug was found attacking rubber in Perak, but when the estate was visited, lady-birds and lepidopterous larvae were found preying on the scale, and as no further damage has been reported, it is hoped that the pest is being held in check. Of termites, *Termes gestroi* was controlled by means of the "Universal White Ant Destroyer," which was also used with good results on colonies of *T. carbonarius* and *T. sulphureus*, termites that sometimes damage newly planted stumps. Against *Xylotrupes*, the fork-horned rhinoceros beetle, and *Brachytrypes*, the large cricket, the Carey system of truncated paper cones was found to be effective. *Xyleborus* sp., a small shot-hole borer, was found attacking full grown trees, but usually only where they had been weakened by too close planting or bad pruning. It is recommended that the system of lopping branches overhanging roads and railways be improved; the cuts should be clean, and made as near the trunk as possible; the cut surface should be tarred. Those estates which leave long stumps with hacked ends are sure to become sources of infection to their neighbours. No cases of healthy trees being attacked by the borer have been recorded.

Plant mites have caused some loss in rubber nurseries, but against these the lime-sulphur spray is usually effective.

Coconuts suffered very little from pests, no serious outbreaks being recorded. The caterpillars of *Brachartona catoxantha* attacked the coconut plantations in the vicinity of Batu Gajah; to prevent the spread of these insects the Inspector of Coconuts had the trees for a time almost completely defoliated and the leaves burnt, leaving only those standing that were not affected. As some of the owners objected, and the Coconut Enactment does not contain provision for dealing with this pest, the process had to be arrested, giving the insect the chance of spreading to neighbouring holdings, which it soon did. At the close of the year the Inspector reported that the drastic treatment adopted at first was entirely successful, and that the foliage on the treated trees was exceptionally good, while 20 per cent. of them were again bearing. The untreated trees, he states, were far inferior in appearance. The final checking of the spread of the pest was accomplished by a parasitic Ichneumonid, which was found present in large numbers at the height of the outbreak. A number of trees were defoliated by two pests, the coconut skipper (*Hidari irava*) and the coconut bag-worm (a Psychid); both of these insects are subject to the attack of Ichneumons. A small Hispid beetle was received from Johore; it is a serious pest of coconuts in the Philippines.

During the year one area of about 200 acres of young coconuts was defoliated by locusts (*Locusta danica*, L.) on an estate in Negri Sembilan. The trees at the close of the year practically all showed signs of recovery. The locust first appeared prominently early in the year on grass-land near the West Coast of Negri Sembilan, whence it spread in the flying stage to Seremban and there started breeding. As a rule the insects were quite contented to feed on the lalang grass, and it was only where this had been cleaned up that they took to other plants, such as bamboo, Indian corn, sugar-cane, etc. Experiments are being carried out with a view to finding out the best methods of combating the pest, even although it is at present doing but little damage to any valuable crops.

Parrott (P. J.) and Hodgkiss (H. E.). **The False Tarnished Plant-Bug as a Pear Pest.**—*New York Agric. Expt. Sta., Geneva, N.Y., Bull.* no. 368, Nov. 1913, pp. 363-384, 11 figs., 8 pls. [Received 14th Feb. 1914.]

During some seasons, pears in different orchards in New York are much disfigured with rough and hard corky spots and are liable to be considerably deformed. In 1908, when the injuries were very severe, investigation was commenced to ascertain the identity of the offender and to develop a satisfactory method of control. In the spring of 1909 careful watch was maintained on a number of orchards and it was found that the flowing of sap from young fruits was due to a number of green hemipterous nymphs. From these nymphs adults were obtained and identified as *Lygus invitus*, Say. The fruit damaged by these insects later became covered with hard corky spots. This bug has also been reported on wild grape blossoms, occasionally on the tender leaves of wild apples which have been intertwined with the wild grapes, on the common soft maple (*Acer saccharinum*, L.), on

peaches, and on the young leaves of the sumach (*Rhus canadensis*, Marsh). In its attack on pears, *L. invitus* shows a preference at first for the tender leaves, puncturing those that are unrolled ; the tissues about the point of injury turn black. Later the young nymph thrusts its proboscis deeply into the substance of the tiny pear and on withdrawing it sap flows from the puncture, drying and leaving a blackish spot. There may be many wounds, and severely injured fruit, besides being badly deformed, may be stunted in its growth. None of the leading varieties of pears seem exempt from injury. When attacking blossom-clusters the young nymphs pierce the bases of the unopened buds and the tender fruit stems. The insect's work on peaches has not been observed under natural conditions, but in confinement nymphs of the third and succeeding instars and adults readily attacked the fruit. Illustrated descriptions of the life stages are given. The nymph passes through five stages, attaining wings at the fifth ecdysis. The larvae begin to make their appearance when the trees are coming into blossom. The adults feed for a short time after emergence, when they disappear.

As a protection to the crops, spraying, just after the blossoming period, is recommended. In the Station spraying tests, tobacco extract (40 per cent. nicotin) "Black Leaf 40," $\frac{3}{4}$ pint of the extract to 100 gals. of water, to which is added 3 lb. of soap, has given the most satisfactory results. The trees should be drenched and both surfaces of the leaves wetted. The removal of wild food-plants is a valuable precautionary measure, the insects being found in largest numbers on wild grapes and to a much less extent on sumach, both common and widely distributed weeds.

Associated with *L. invitus* have been found *Lygidea mendax*, Reut., abundant on pears, plums and apples ; *Campylomma verbasci*, Meyer, attacking pear foliage and fruit in a manner quite similar to that of *L. invitus* ; *Paracalocoris colon*, Say, found on Bartlett pears ; and *P. scrupeus*, Say, commonly associated with *L. invitus* on wild grape, feeding on the tender leaves and blossom-clusters.

J. W. *Polychrosis botrana* **oder der bekreuzte Traubenwickler in unseren Weinbergen.** [The Crossed Vine-moth in our Vineyards.]—*Luxemburger Weintzg., Grevenmacher*, i, no. 31, 1st Dec. 1913, pp. 529-531.

Four *Polychrosis botrana* moths were found among the thousands of *Clysia ambiguella* captured in the 100 vine-moth traps set in 1911. In view of this very small percentage no action was taken at the time, but in the meanwhile *P. botrana* has increased. Among 200 moths caught in 10 traps on the 25th July 1913, ten were *P. botrana*. No further specimens were found in ten other traps set higher up in the same vineyard. Vine-growers must adopt immediate measures to combat this new pest, for even if some observers (Capus, Feytaud, Dufour) are right in stating that where *P. botrana* increases the other species decreases to almost vanishing point, this only means exchanging a bad enemy for a worse.

Soule (A. M. G.). **Parasite Introduction to Maine.**—*Qtrly. Bull. Maine Dept. Agric., Augusta*, xii, no. 4, Dec. 1913, pp. 10-18, 6 pls.

The first importations into Maine of insect parasites of the gipsy and

brown-tail moths were begun in 1905. The results have been so encouraging that, after eight years' experience of mechanical control, it was considered advisable to attempt the colonisation of parasites to supplement the hand-work in Maine, and last March a laboratory for breeding parasites and observing their work was established in Portland. The work of breeding and liberating thus far has been with *Apanteles lacteicolor* and *Meteorus versicolor,* as enemies of the brown-tail moth, *Compsilura concinnata,* parasitic on both the gipsy and brown-tail moths, and the *Calosoma sycophanta* beetle, also predatory on both insects.

*A. lacteicolor* is a very small hymenopterous fly, native to most European countries that are infested with the brown-tail moths. These Braconids deposit their eggs under the skin of the newly-hatched caterpillars. In Maine, brown-tail webs, collected in localities known to be infested with *Apanteles* and *Meteorus,* were brought to the Maine laboratory, and placed in feeding trays. As soon as a sufficient number of cocoons of the parasites were obtained from the infested caterpillars, they were carried into the field for colonisation as quickly as possible before the adult had emerged. The cocoons were placed in a water-proof box, nailed to the tree, both tree and box being smeared with tanglefoot to prevent destruction of the cocoons by ants, and here left to emerge. In this way about 15,000 cocoons have been distributed. A sufficient number of *Meteorus versicolor* cocoons were also obtained to establish two colonies of this parasite, the life-history of which is similar in some respects to that of *Apanteles.*

Work was then continued on *Compsilura concinnata,* a Tachinid fly, which deposits beneath the skin of the host caterpillar, the very small maggots which have hatched within the body of the female; these maggots establish themselves within the alimentary canal of their host and in two weeks have attained complete larval development, when they issue from the caterpillar, leaving it dead. Within a few hours they enter the pupal stage, and after a week the flies emerge, the females attaining full sex maturity in two or three days. Several colonies of this parasite have been liberated, and it should prove of great economic importance, as it will attack both the gipsy and brown-tail moths with avidity, and at least sixteen other insects native to Maine are known to serve as its hosts, including the cabbage butterfly and the tussock moth.

The beetle, *Calosoma sycophanta,* preys voraciously on the caterpillars both in its larval and adult stages. The eggs are deposited in the ground and hatch in from five to eight days, the larval life lasting about two or three weeks. The average number of eggs laid during one season by one female beetle is about one hundred. *C. sycophanta* can apparently feed on caterpillars affected with the "wilt disease" without any ill results.

Two egg-parasites will also be imported, *Anastatus bifasciatus* and *Schedius kuvanae.* During the time that is needed for the parasitic and predatory enemies to control the rapidly increasing infestations and assist in restoring "the balance of nature" which has been disturbed, hand-work must be continued and a very active warfare waged against the gipsy and brown-tail moths.

√CUSHMAN (R. A.) **The *Calliephialtes* Parasite of the Codling Moth.**—*Jl. Agric. Research, Dept. Agric., Washington*, i, no. 3, 10th Dec. 1913, pp. 211-237, 10 tables, 15 figs., 1 pl.

This parasite (under the names of *Calliephialtes messor*, Grav., and *Ephialtes carbonarius*, Christ) was introduced into California in 1904 from Spain, where it was found by Compere attacking codling moth (*Cydia pomonella*). Up to this time *C. messor* had been mentioned in literature only once since its description; this was by Taschenberg, who in 1863 recorded it as having been reared as a parasite of *Galleria mellonella*, the wax moth. Specimens identical with *C. messor* have been identified as *C. comstockii*, Cress., and *C. pusio*, Walsh, by different authorities. From California specimens of the parasite were sent in 1907 to the Cape of Good Hope and were released there by Lounsbury; but the results were of doubtful value.

The author gives a detailed account of the methods used by him in rearing the parasite, and also of the anatomy of the insect in its various stages and descriptions of its habits in feeding and reproduction. Oviposition began about nine days after the emergence of the female. The stage of the host selected is the full-grown larva in its cocoon; in no case was any other stage attacked. The incubation period varied from 1 to 7 days, depending on the temperature; a table is given showing this variation. *Calliephialtes* is normally a solitary parasite, although more than one egg was often deposited on a single host; when this happened only one larva developed beyond the early stages. The larva begins feeding shortly after hatching, and continues until there is nothing left of the host but the skin, which is finally pushed to the end of the cocoon. The feeding period, from the hatching of the egg to the beginning of the cocoon, varied from 3½ to 18½ days, with an average of about 7¼ days. The larval period in the cocoon varied from 4 to 14 days; the females, after spinning their cocoons, required on the average about 2½ days longer to attain the pupal stage than the males. The pupal period lasts from 6 to 13 days, and again the female requires somewhat longer than the male, to the extent on the average of about 1·66 days. The males outnumbered the females throughout the period covered by the observations, and it was found that the proportion of males increased with each succeeding brood. Of the 57 individuals reared from parthenogenetic eggs all were males.

The adults feed at all times on sweet liquids supplied to them; the males confined their feeding to this sort of diet, but the females frequently fed on the juices of codling moth larvae. Keeping the cocoons in the cold retards their development, which, however, proceeds normally when the insects are removed from cold storage; in the present observations it seemed as if exposure to cold for any length of time had the effect of reducing the activity and vitality of the resulting adults. L. J. Newman, on the other hand, states that the keeping of immature specimens in cold storage for a period of 14 months in no way affected development nor the condition of the adult.

The first female to emerge from hibernation in the spring of 1912 appeared on 3rd May, and the last on 15th May; from the earliest female progeny three complete generations were reared and from the last, two generations. The insect hibernates as a full-grown larva in its cocoon. The females appeared in the spring a few days in advance

of the first adult codling moth, that is, about 40 days before they could, under natural conditions, attack the first brood of larvae of the moth. This would result in a very small first generation of the parasites unless they would attack some other host, since the hibernating brood of parasites would have passed the greater portion of their adult life before an abundance of codling-moth larvae could be found. To determine if *Calliephialtes* would attack other species of insects, larvae of *Enarmonia prunivora*, Walsh, *Euzophera semifuneralis*, Walk., and *Gnorimoschema gallaesolidaginis*, Riley, were placed in the propagating cages with ovipositing females of the parasite. A larva of *Enarmonia* was parasitised within two days, a diminutive male *Calliephialtes* emerging from the cocoon 22 days later; this specimen was much smaller than the normal full-grown larva and it is doubtful whether *Enarmonia* would serve in the long run as an alternate host. Neither of the two remaining species was parasitised. Codling moth larvae containing the internally parasitic larvae of *Ascogaster carpocapsae* were readily attacked by *Calliephialtes*; this always resulted in the death of the earlier parasite and the production of a diminutive adult *Calliephialtes.*

Essig (E. O.). **A New Eriococcus.**—*Jl. of Entom. and Zool., Claremont, Cal.*, v, no. 4, Dec. 1913, pp. 179-181, 2 figs.

In this paper the author gives a detailed description of a new scale-insect, *Eriococcus cockerelli.* It occurs in Mexico, and has been reported on "Chino." As this is the Spanish word for quinine the plant probably belongs to the genus *Cinchona.*

Fletcher (T. B.). **Report of the Government Entomologist, 24th April 1912 to 31st March 1913.**—*Operations of the Dept. of Agric., Madras Presidency*, 1912-1913, *Madras*, 1913, pp. 36-41.

The Report, which is the first since the entomological department became an independent section in April 1912, begins with a description of the organisation of the section, its laboratory accommodation and of its facilities for field work. Tours were made in many localities for the investigation of insect pests.

The Deccan grasshopper did considerable damage in the western taluks of the Bellary district in 1911, and a similar attack was expected in 1912. Accordingly cultivators were instructed in the use of bag-nets, and were informed of the life-history of the insect and the preventive measures that may be used. The grasshopper seems to be increasing its area of distribution eastwards and southwards from the northern and western parts of Bellary; on first arrival in a new district it is little noticed as a rule, being in small numbers, but the insects increase rapidly, so that in three or four years they may cause the complete destruction of all the dry crops; after this their power is somewhat abated by the increasing efficiency of natural enemies, chiefly Cantharid beetles. The attack in Bellary in 1912 proved after all to be slight in the western taluks, but at Beeravalli a few hundred acres were found to be heavily infested. Another grasshopper, *Epacromia dorsalis*, was reported as attacking young ragi and daincha crops in Madura; the attack was over before steps against it could be taken.

The cotton-stem weevil (*Pempheres affinis*) does considerable damage to exotic cottons in the Coimbatore district, to which at present this pest seems to be confined. The larva bores into the stem just above the ground, causing a swelling and weakening of the stem, so that heavy wind or rain often cause it to snap across. No successful methods of combat have been devised.

Caterpillars of *Stenachroia elongella* were found webbing earheads of cholam at Hagari; several cases of swarms of caterpillars of *Spodoptera mauritia* on paddy, fodder grass, etc., were reported. *Nymphula depunctalis* was found attacking paddy, mostly in Malabar. *Agrotis ypsilon* was reported as causing great damage to potato plants in Yucaud; spraying with different insecticides, collection by hand of the caterpillars, trapping caterpillars and moths, and laying down attractive bait were all tried; but although large numbers were killed the attack remained so severe that about 80 per cent. of the crop was lost. Investigation of this pest is being continued. The semi-looper moth (*Acha melicerta*) was taken on castor; sporadic outbreaks of this pest were checked by handpicking of the caterpillars. *Azygophleps scalaris* was found attacking Bengal daincha plants. Caterpillars of *Euplexia conducta* were the cause of damage to safflower; spraying with lead chromate was ineffective, but spraying with lead arsenate quickly checked any further damage. The caterpillars of *Chilo simplex* were found boring in cholam, etc., and those of *Diatraea* sp. in sugar-cane.

Coffee in the Nilgiris was badly attacked by the Pentatomid bug, *Antestia cruciata*. Scale-insects infested Babul (*Acacia arabica*) at Coimbatore; predaceous enemies were present, but these in their turn were attacked by black ants (*Camponotus compressus*). Isolation of the affected trees by cutting away branches, etc., in contact with the ground, and painting a ring of tar and crude oil emulsion (half and half) round the stem kept away the ants, when the natural enemies quickly checked any further increase of the scales. The rice-bug (*Leptocorisa varicornis*) was observed attacking paddy on a Coimbatore farm; it was found by experiment that small hand-nets were more effective than large bag-nets for control of this pest. *Aleurodes bambusae* attacked giant bamboo at Coimbatore. A Fulgorid, *Pundaluoya simplicia*, caused severe but local injury to cholam at Coimbatore in August; as the insect lives protected inside the leaf-sheaths and only sucks the juice of the plants, measures such as spraying are useless; cutting the affected plants for fodder, or flooding the field seem the only practical methods of control.

In November and December 1912, a blue-bottle fly bred in large numbers in the fish-offal along the coasts of South Kanara and Malabar. These flies flew inland and congregated on the spathes of the toddy-palms, sucking up the toddy as it exuded, and discolouring the little that remained with their excrement. The flies also infested the shops of toddy-sellers, causing considerable nuisance. A leaflet in English and in Kanarese on methods of protecting the collecting pots on the trees from access by the flies is being prepared.

Termites (*Odontotermes*) were found attacking young coconut palms at Quilandi, Malabar. The case was interesting because the species doing the damage appeared to be identical with that reported as

building mounds in the adjacent areas; as a general rule, mound-building termites do not attack growing crops.

Cholam suffered from the attacks of mites; the pest was checked by a Coccinellid beetle, which devours the eggs of the mite; no remedial measures have yet been devised; a similar mite, attacking sugar-cane seedlings, was controlled by dusting with flowers of sulphur.

Broods of Eri silkworms (*Attacus ricini*, Boisd.) were kept through the year, but the climate of Coimbatore is too dry to suit the insect. Steps were taken during the year for the improvement of the mulberry silk industry of the Kollegal district. A small number of univoltine mulberry silkworm eggs received from Pusa were reared, but proved unsuccessful.

Two cases of the importation of living insect-pests with sugar-cane sent from Antigua and from Java were met with during the year.

The report closes with some remarks on the future development of entomological work in Madras; it is urged that the present work of the Government Entomologist be divided into three groups:—(*a*) general routine work, (*b*) research in agricultural entomology, and (*c*) research in medical and veterinary entomology, and that each should occupy the whole of one man's time; the difficulty of doing justice to any one of these branches is pointed out as being very great for one man alone, while the need for research is emphasised by the citation of cases in which valuable crops have suffered serious damage through a lack of knowledge of the proper means of protection.

Chittenden (F. H.). **The Abutilon Moth.**—*Bur. Entom. U.S. Dept. Agric., Washington, D.C., Bull.* 126, 6th Dec. 1913, 10 pp., 5 pls.

During September 1909, many larvae and pupae of the abutilon moth (*Cosmophila erosa*, Hb.) defoliated okra, hollyhock, and abutilon on the farm of the Virginia Truck Experiment Station. The insect occurred in large numbers and was a serious pest. Hollyhocks and abutilon were attacked throughout the following November. Early in August 1912, the author noticed this species at work on the grounds of the Department of Agriculture, seriously injuring abutilon. Mr. J. F. Strauss collected this species on the 20th August 1912, on okra (*Hibiscus esculentus*) at Washington, D.C. In all cases observed the 12-spotted cucumber beetle (*Diabrotica* 12-*punctata*, Oliv.) caused some of the damage, while ants also invaded the open bolls, which they were devouring. In the author's experience abutilon is preferred to hollyhock. The insect does not spread to any great extent, and Hibiscus may not prove to be its natural food-plant. A list is given of the various names under which this species has been described; in literature it has generally been mentioned as *Anomis erosa*, Hb. The moth very closely resembles the cotton moth (*Alabama argillacea*).

Experiments were made on the infested abutilon with the following spray formula:—Nicotin sulphate (40 per cent.) $\frac{1}{2}$ oz., whale-oil soap $\frac{1}{2}$ lb., lukewarm water 5 gals. The soap was thoroughly dissolved in the 5 gals. of water and the solution, after the addition of the nicotin, was thoroughly agitated. During calm, clear weather the plants were sprayed in the morning, while some dew remained on them, and in the form of a fine spray or mist from all sides. Two days after this treatment about 90 per cent. of the larvae were dead. Four or five

observed to be alive were believed to have come from adjoining unsprayed plants. In a few days the plants began to take on a new appearance, putting out a second growth of leaves. Three weeks afterwards, however, another lot of larvae attacked the same plants. When discovered they were full-grown and about to inflict considerable injury. The same solution was applied again; all the insects were eradicated, and the abutilon plants throve free from any pest up to the end of the season. It is believed that some of the insects were in the egg stage when the first spraying was carried out and that they are not affected when in this condition. None of the insects made their appearance in the Department grounds during 1913, showing either the absolute thoroughness of the application, or possibly that they never returned to this particular locality. A bibliography of the principal literature concludes the paper.

PATTERSON (W. H.). **Report of the Entomologist.**—*Government of the Gold Coast, Report Agric. Dept. for* 1912, *Accra*, 1913, pp. 22-25.

The slate-grey leaf beetle (*Adoretus hirtellus*, Castn.) has damaged cacao foliage at Aburi and Assuantsi and in cases of severe attack the leaves are skeletonized. Nothing is known of this insect's life-history. A solution of lead arsenate, 2 lb. in 50 gals. water, forms an efficient spray, but as this is too costly it is proposed to try lead chromate as an insecticide for insects on cacao. The grey moth pod-borer (*Characoma stictigrapta*, Hmp.) does not cause primary damage of importance, as usually the outer wall of the pod alone is eaten, but there is always a risk that the injured area may give saprophytic and parasitic fungi a hold. No instances have been reported as yet, but as the larvae are on the increase it would be well to destroy them when the pods are harvested. "Sankonuabe," "Akate," cacao bark-sapper, and bark-louse are various popular names which are given indiscriminately to two distinct species of Capsid bugs, viz., *Sahlbergella theobroma*, Dist., and *S. singularis*, Hagl., which are both serious pests of cacao. Besides puncturing the bark and causing it to split open and die, these insects also pierce the developing fruits, thus producing "scabby" pods. In addition to this direct damage, there is also grave danger of fungoid infection. The red tree ants of the genus *Oecophylla* are stated to destroy these pests and the author is informed that the native farmers are placing the carton nests in infested trees with favourable results. Thrips have been found in places damaging leaves and pods of cacao. Bag-worms or case-worms are found eating cacao foliage or branches. When these Psychid caterpillars are present in numbers sufficient to cause damage of economic importance the cases can generally be collected by hand and destroyed. The Longicorn stem-borers, *Armatosterna buquetiana*, White, and *Glenea* sp., are rather scarce at present. White ants are reported to give much trouble on some farms.

The *Adoretus* beetle attacks kola in the same manner as cacao. Some of the damage to kola seeds formerly attributed to a weevil, *Balanogastris kolae*, Desbr., is due to a fruit fly (*Ceratitis* sp.), which lays its eggs in the half-developed fruit, generally on the seed testa, on which the larvae feed exclusively. Though comparatively little harm is done, the seeds are not so readily marketable owing to their becoming

discoloured. To reduce the numbers of this fly infested fruits should be buried not less than two feet deep, the soil above them being well rammed down. *Balanogastris kolae* does not interfere with healthy kola fruits and if these are collected as soon as ripe no damage will occur.

Coconuts were injured at Assuantsi by a rhinoceros beetle (*Archon centaurus*, F.). Collection was found an efficient means of control for a time. This beetle has also been reported as breeding in screwpines (*Pandanus*) at Tarkwa. COCCIDAE have not been very troublesome, though *Aspidiotus destructor*, Sign., heavily infested the coconut plantations at Assuantsi. Though much hampered by the dry season, the entomogenous red-headed fungus, *Sphaerostilbe coccophila*, was seen destroying the scales. A predaceous lady-bird beetle, *Scymnus* sp., is being established at Assuantsi to help control. Besides the above-mentioned fungus, others of the same valuable group, viz., *Ophionectria coccicola*, *Aschersonia oxyspora*, *Aschersonia* sp. and an undetermined one, have been discovered. The leaves of young Funtumia rubber in nurseries are often much injured by the Funtumia moth, *Glyphodes ocellata*, Hmp. Parasites do not appear effective in controlling these larvae, as the only one yet found, a Tachinid fly, is itself heavily parasitised by a Hymenopteron. The remedies therefore available are: (1) the picking or squeezing of infested leaves; (2) the dusting of the dew-moistened leaves with a mixture of Paris green 1 lb. and air-slaked lime 6 lb.; (3) spraying with lead arsenate, as recommended for the *Adoretus* beetle of cacao.

The growing crops of corn are not seriously troubled by pests, but enormous loss is caused to the harvested grain by the corn weevil, *Calandra oryzae*, L., which starts its ravages with the ripe grain in the fields. The author hopes that provision will be made for the fumigation of all seeds and plants at the ports. One instance showing the need for such a measure is that a small consignment of mango seed from Ceylon was found to contain a number of mango-seed weevils, *Cryptorrhynchus* sp.

BALLOU (H. A.). **Work connected with Insect and Fungus Pests and their Control.**—*Report Agric. Dept., St. Vincent for* 1912-1913, *Barbados*, 1913, pp. 11-17.

*Cotton pests.* The prompt and vigorous use of Paris green checked the ravages of the cotton worm (*Alabama argillacea*), this being the second time since the re-establishment of the cotton industry that artificial control was necessary. The pest occurs every year, but is combated by its natural enemies, of which the "Jack Spaniard" wasp (*Polistes annularis*) is the most important. In Bequia, one of the Cays, where the worm abounds, there are no Jack Spaniards, or at least very few. Planters must always be prepared to resort to poisons immediately it is found that the caterpillars have not been held in check by their natural foes. The freedom from leaf-blister mite (*Eriophyes gossypii*) appears to the author to be the result of extreme vigilance on the part of the planters and others concerned in keeping down this pest. The Ordinance which provides for the destruction of old cotton at such a time as to cause a complete break each year in the food supply of the mite, seems especially useful. Black scale

(*Saissetia nigra*) is a serious pest at times, but over small areas. It is not parasitised to anything like the same extent in St. Vincent as in Barbados, where the Chalcid, *Zalophothrix mirum*, appears to be a more efficient check on the scale than in other islands. For several years past a small bronze beetle has attacked young cotton in St. Vincent and the Cays, eating the leaves and probably causing a certain amount of injury to the plants.

*Coconut pests.* Though present in all parts of the island, scales and whitefly only occasionally occurred in such abundance as to indicate any great damage being done. The Bourbon scale (*Aspidiotus destructor*), the tessellated shield scale (*Eucalymnatus tessellatus*), and occasionally the black lime scale (*Ischnaspis longirostris*) occurred in some numbers. The *Eucalymnatus* appeared to be well controlled by the fungus, *Cephalosporium lecanii.* Two species of whitefly occurred, *Aleurodicus cocois,* Curtis, and a species of *Aleurodes*, which frequently is found in company with it. If remedial measures become necessary, cutting out the old leaves and spraying the remainder with a contact insecticide would seem the best course to follow. Judging from some small trials, " Scalo " appears of value for this purpose. Every injury or cut in a coconut palm should be tarred immediately to prevent egg-laying by the palm weevil. This weevil (*Rhynchophorus palmarum*) occurs generally throughout St. Vincent and appears to be greatly on the increase. The clearing of land for cotton-growing is responsible for this. Among the growths cleared were gru-gru palms (*Acrocomia lasiospatha*) which were ordinarily killed by the larvae of the palm weevil after a few slashes with a cutlass had been made in the trunk to aid the female weevil to gain access to the soft part of the stem for the purpose of egg-laying. All plantations of coconut palms must be carefully watched and at the first sign of attack the grub must be dug out and the wound treated with an application of tar. The softer portions of the stem of the gru-gru and coconut palms, cut in lengths of, say, 3 or 4 feet, and split in half, might be used in coconut plantations as traps for the palm weevil. They should be collected after some four or five weeks and destroyed, and a new lot put down for traps.

*Arrowroot pests.* The arrowroot in all parts of St. Vincent seemed to be healthy and not injured by insects. The most common and best known pest is the arrowroot worm, the larva of a " Skipper " butterfly, *Calpodes ethlius.* In St. Vincent the worms are searched for in the rolled leaves and when found are crushed with the fingers. The rhizomes of arrowroot are often attacked by some insect which tunnels into them, forming cavities which fill with soil and cause much extra work in the preparation of starch.

*Lime pests.* In all parts of the island citrus trees are attacked by scale-insects ; black blight is to be seen on practically every citrus tree, and in the majority of cases in considerable abundance. The green scale (*Coccus viridis*) and the white scale (*Chionaspis citri*) are most frequently seen, while purple scale (*Lepidosaphes beckii*) is unusually rare. Green scale is very common and seems to be parasitised by the *Cephalosporium* fungus to such a degree as to prevent its becoming a serious pest.

*Ground-nut pests.* The Pentatomid bug, *Edessa meditabunda*, attacks ground-nuts in St. Vincent. The author does not know whether spraying would be profitable, but suggests that experiments

be made with "Scalo." This insecticide is a mixture of whale-oil soap and kerosene, the formula for which has been worked out by Mr. J. C. Moore, Agricultural Superintendent, St. Lucia. The stock mixture is easily diluted in water, the soap holds an unusually large percentage of kerosene, which does not separate out even when kept for a long time. To control the bug, spraying would have to be done at a time when the eggs were hatching or had just hatched—when the greatest number of young were present. Ground-nuts are also attacked by several other bugs, and by a small caterpillar which tunnels into the tips of the stems. Mole crickets are also said to damage them.

*Cassava pests.* The cassava at the Agricultural School was attacked by a species of Thrips which caused a considerable deformation of the leaves, but the author does not believe that it causes very much injury to the crops.

*Pigeon-pea pests.* The white scale (*Hemichionaspis minor*) is controlled to a large extent by parasitic insects and is not likely to cause much injury to pigeon-peas when these occupy the land as a 12–15 months crop, but if allowed to remain a second season they are likely to become seriously infested, even to the point of infecting adjoining cotton fields. No specific directions can be given for the control of the caterpillars which sometimes eat the leaves, or of the weevils which attack the pods; but it is hoped planters will report the first appearance of any of these pests so that more complete knowledge may be arrived at.

Writing after the date of the above report the author mentions that the cotton worm continued to spread but was heavily parasitised by two Chalcid flies, *Chalcis ovata* and *Chalcis* sp., and quickly disappeared. This outbreak drew attention to the desirability of giving still further encouragement to the Jack Spaniard. A trial was made with a small open shed, and a point clearly brought out was that effective shelter from wind and rain is necessary and that the roofs of the sheds should be raised to a height of not less than 7 feet so as to allow the nests to hang well above the heads of labourers who may take temporary shelter in showery weather under the sheds. "Scalo" has been found very effective, and if used at the rate of 1 lb. to a gallon of water was found not to damage any but the very tender plants.

A "Stoppeur" air-compressing pump and four compressed air knapsack sprayers proved very effective. Specimens of the "Furet" duster were also obtained. This is quite the best type of appliance so far used for applying insecticides in powder form. It is worked by one hand alone, and by a simple contrivance it can be regulated to eject a fine, medium, or heavy dust.

**Report on the Experiment Station, Tortola, Virgin Islands,** 1912-13.—*Agric. News, Barbados*, 8th Nov. 1913, p. 363.

The heavy rain in October promoted the cotton crop, but insect pests also multiplied, and a severe attack of cotton worms (*Alabama argillacea*) resulted in many districts. To allow peasant growers to deal with this pest, considerable quantities of Paris green were given away. With Sea Island cotton, success has followed selection work with Cameron 106, a strain numbered 12·5 being remarkable in that it is a late bearer, remarkably vigorous, and decidedly resistant to leaf-blister mite.

**Insect pests at St. Croix.**—*Agric. News, Barbados,* 22nd Nov. 1913, p. 378.

The most important sugar-cane pest in St. Croix (D.W.I.) is the rhinoceros beetle, *Strategus titanus* [see this *Review*, Ser. A, i, p. 254] and the pink mealy bug, *Pseudococcus sacchari,* is of fairly frequent occurrence.

**A pest of oranges.**—*Agric. News, Barbados,* 22nd Nov. 1913, p. 378.

The occurrence of a pest causing injury to oranges in Dominica, has recently been reported. It is a small moth related to the codling moth (*Cydia pomonella*). The larva injures the fruit by penetrating the skin and feeding in the pulp of the orange, which becomes discoloured and rotten in the vicinity. Even when no further injury is done than the puncture of the skin, the fruit is rendered unsaleable on account of the discoloration at the point of attack and the malformation which often results. This pest was first noticed in 1907, and again in 1908. Remedial measures, and especially spraying with lead arsenate, led to complete control in 1909 and 1910. Since then no records of its occurrence have been received until 1913. The agricultural officers in Dominica state that the attack begins in May or June, the egg being laid on the surface of the fruit. During August, the larval stage is completed and the full-grown caterpillar leaves the fruit (which by this time has fallen to the ground) and enters the pupal stage amongst the leaves on the ground. About two weeks later the moths emerge. What becomes of the insect in the other months is not known. The most successful control resulted from spraying with lead arsenate, applied early in the season, in order that the newly hatched caterpillars may be poisoned as they attempt to eat their way through the orange skin.

Urich (F. W.). **Entomologist's Report.**—*Minutes Meeting Board Agric. on 21st Nov.* 1913, *Trinidad,* pp. 53-54.

*Froghoppers.* During the years 1912 and 1913, 51 fields out of 110 on an estate in the Couva district of which a record was kept were affected. In 1912, 25 fields were badly affected, 19 slightly, and 7 had no blight. In 1913, 8 fields were badly affected, 24 slightly and 19 had no blight; 6 fields were badly blighted in 1912 and 1913; 5 fields were slightly blighted in 1913 which were not so affected in 1912. Ratoon canes were mostly affected. *Egg-parasites*:—The survey for the occurrence of egg-parasites is not completed yet, but to the end of September 1913 they occurred in 12 fields and with the exception of one, none of the fields had blight at any time during 1912 and 1913. The single field referred to was only slightly blighted in both years. *Green Muscardine Fungus*:—In 1912, of the 51 fields 19 were sprayed with fungus spores, and in 1913, 16 fields were similarly treated; 12 fields with blight sprayed with spores in 1912 showed no blight in 1913; 7 blighted fields, although sprayed with spores in 1912, showed blight again in 1913, but as a rule the blight was slight, showing that some good was done. *Spread of Froghoppers*:—In 1913, five new fields were attacked and all were near fields affected in 1912, showing that the spread of the froghoppers was restricted for the period under review.

*Cacao*:—Since the last meeting there has not been any increase in Thrips and cacao beetles, the former are still in abeyance and the latter are being caught in places where the trees are in bad condition, either owing to soil or exposure to wind and sun. The author reports that more interest is taken in the control of cacao beetles in the southern part of the Island and small quantities of arsenate of lead are being issued to peasant proprietors.

Kränzlin (—). **Die Wollausplage in Daressalaam.** [The Mealy Bug plague in Dar-es-Salaam.]—*Der Pflanzer, Dar-es-Salaam*, Oct. 1913, ix, no. 10, pp. 493-507, 6 pls.

In November 1911, the park authorities in Dar-es-Salaam reported that a *Pongamia glabra* tree was apparently the victim of a pest, and inspection showed that all the lebbek trees (*Albizzia lebbek*) were attacked. The author states that the insect is native to East Africa, where its occurrence has been reported before in various places, but it is not peculiar to the region, for Newstead and Willcocks have published an account of its appearance in Cairo in 1909 (*Bull. Entom. Research*, i, pp. 121–141). Its name is *Pseudococcus filamentosus*, Ckll., (*Dactylopius perniciosus*, Newst. and Willcocks). It is not supposed that ants act as carriers of the bug, although they feed on its sugary excreta, but birds are believed to be agents in its sudden appearance in localities far distant from infested areas. Besides *Albizzia lebbek*, which suffers most severely, *Pongamia glabra*, *Pithecolobium saman*, the silk-cotton tree (*Eriodendron anfractuosum*) and citrus trees are complete hosts ; but the bug also thrives on the following, though not to so marked a degree :—*Sapindus saponaria*, *Chrysophyllum cainito*, *Landolphia* sp., *Tectona grandis*, species of *Ficus*, species of *Bambusa*, *Khaya senegalensis*, *Sterculia alata*, cotton (but Hibiscus remains untouched), *Melia azedarach*, Palms (only on the head when flowering), grasses, *Agave americana* var. *sisalana*, *A. rigida*, *Encephalartus*, *Arum*, *Adansonia digitata*, *Albizzia odoratissima*, *A. procera*, *A. stipulata*, *Acacia catechuoides*, *Forsteronia floribunda*, *Swietenia mahagoni*, *Calophyllum inophyllum*, *Vitex cuneata*, and *Sorindeya*. The author points out that *Sapindus saponaria* may perhaps be placed among the complete hosts. The others only appear to harbour the mealy bug when they are close to a centre of infection. But attention is drawn to the fact that the insect seems capable of adapting itself to plants which at first did not appear suitable. An example of this is provided by the mango trees (*Mangifera indica*) in the suburbs of Dar-es-Salaam, which seemed immune for a long time, but gradually became badly infected. Trees and plants which apparently enjoy immunity are : *Terminalia*, *Ponciana*, *Caesalpinia pulcherrima*, Tamarinds, Casuarinas, all varieties of *Eucalyptus*, *Pandanus*, *Plumiera*, *Peltophorum*, *Santalum*, *Bauhinia*, *Bougainvillea*, *Pithecolobium dulce*, *Syzygium guineense*, *Alamanda*, *Theretia neriifolia*, *Barringtonia racemosa*, *Anacardium occidentale*, *Adenanthera* and many varieties of *Sterculia*.

The ravages were so sudden and so destructive that immediate and drastic measures were necessary to stamp it out. The enormous cost of spraying big trees infested by so minute an insect could not be faced. It was therefore decided to lop away all foliage and twigs and scrub the bare stumps with a spray-solution made up as follows :—

2 lb. of hard soap is dissolved in 1 gal. of hot water; while this solution is still hot 7 quarts of petroleum are added and the whole is stirred till emulsified. When cold, water is added to a total bulk of 20 gals. and the insecticide is ready for use. Grass and undergrowth were removed where present, and some very badly damaged trees were felled. At the end of the chief rainy season the lebbek trees were covered with foliage in which but few of the insects were noticeable. The other trees which had been cut back were free. Those trees and plants which were not complete hosts were now free with the exception of those mangos on which the insect had adapted itself; these were still rather heavily infested. But success was only apparent. Writing one year after the foregoing measures were resorted to, the author states that the lebbek trees were infested anew and the others, though still free, would be infected in time. A repetition of the former drastic method would probably kill the trees. A species of lady-bird (COCCINELLIDAE) has proved a natural enemy and from being rare has now multiplied exceedingly and is found on every lebbek tree. A bird, one of the common mouse-birds (*Colius*), also preys on the *Pseudococcus*, but is a doubtful auxiliary, as it may carry infection. In view of the fact that lebbek trees are short-lived the author thinks that the selection of other species for re-planting is the only satisfactory solution. The removal of existing *Albizzia* would only anticipate by some years what would be ultimately unavoidable.

BAER (W.). **Die Bedeutung der insektenfressenden Vögel für die Forstwirtschaft.** [The importance of insect-eating birds for forestry.] —*Aus der Natur, Leipzig*, July, 1913, ix, pp. 659-671.

It is well known that birds consume enormous quantities of insects. An example of this was provided by two great tits (*Parus major*) which devoured 187 pupae of *Malacosoma neustria*, L., in 13 hours; and again three blue tits (*Parus coeruleus*) and three cole tits (*Parus ater*) consumed 9,500 to 10,000 eggs of the processionary moth daily for a time. Three marsh tits (*Parus palustris*), one cole tit, one long-tailed tit (*Parus caudatus*) and two gold crests (*Regulus regulus*) made away with 1,876 caterpillar of *Bupalus piniarius*, L., in a single day. Recent investigation of this subject is based on very numerous examinations of stomach-contents undertaken by the Biologische Reichsanstalt für Land- und Forstwirtschaft, the Forstakademie Eberswalde, the Forstakademie Tharandt, the members of the Bayrische ornithologischen Gesellschaft, the Leipzig Ornithological and Entomological Societies, and many others. The most important works have been recorded by K. Eckstein in his annual reports in the "Allgem. Forst- und Jagdzeitung." The results of this particular investigation prove that birds have a preference for certain insects. This may apply either to all birds or only to certain species. In many cases also the investigator is surprised at finding in their stomachs insects which live hidden and apparently secure from pursuit. The following is a very limited list of some of the chief instances from the wealth of facts collected in this paper:—The starlings and ravens devour the larvae of the crane-fly (*Tipula*) and those of Elaterid beetles, as well as the caterpillars of *Agrotis*. The roller (*Coracias garrula*) devours

*Hylobius abietis*, a dangerous forest pest; the carrion crow (*Corvus corone*), starling, partridge, etc., also feed on it. The grub of the cockchafer is a general delicacy and one much appreciated by the crow and starling, and it has been proved to be the prey of birds which are not at all suspected of seeking after it, such as the common buzzard, the green woodpecker (*Picus viridis*) and the cuckoo (*Cuculus canorus*). Grasshoppers are a favourite food of practically all birds, and investigation shows that this applies in a large measure to the earwig; while the mole-cricket is also a general victim, and even the eagle owl (*Strix bubo*) pursues it. All the smaller birds devour the oak Tortrix (*T. viridana*). The larch miner (*Coleophora laricella*, Hb.) appears to exercise a very great attraction for the smaller birds, among which the cole tit takes first place in this respect. Some surprising results have been obtained in Austria. On one occasion the crop of a wood-pigeon contained 674 pupae of *Tortrix murinana*. Besides these, which were counted, there was a remainder estimated at about 300. This discovery was followed by that of 122 in a cole titmouse; 200 and 300 in two missel-thrushes; and 53 in a blackcap. Those insects which attack timber are naturally of special interest in forestry. Here again birds are very active. The larger spotted woodpecker (*Picus major*) seeks after the Longicorns, *Saperda populnea* and *Tetropium castaneum*, the big bark-beetle (*Dendroctonus micans*), and the larva of the leopard moth (*Zeuzera*). Passing to the nun moth (*Lymantria monacha*, L.), *Dendrolimus pini*, L., and other serious forest pests, the author remarks that the starling is not always to be relied upon as a means of control, but in many instances this bird has cleared infected areas thoroughly and quickly. The foresters of the See Estate, in Prussian Oberlausitz, consider that the distribution of 600 starling-boxes in their woods once saved these from the nun moth, while neighbouring properties were damaged. It was also noticed that in those places where the boxes were fewest, the traces of the insect were seen the earliest. But the cuckoo is the regular and most formidable enemy of the nun moth. A good example of its activity is reported by Altum, who states that in 15 days about 100 cuckoos absolutely cleaned out what threatened to be a dangerous centre of infestation. The much-abused jay (*Garrulus glandarius*) also preys unceasingly on the nun moth, caterpillars, pupae, and egg-bearing females of which are found in its stomach even at times when the pest is thought to be quite in abeyance. Such finds are naturally a practical guide to the forester. The cuckoo is singular in its taste for the processionary caterpillar, which it devours with avidity, while other birds strictly avoid it. Indeed it is believed to have nipped in the bud infestations which showed every promise of rapidly spreading to a ruinous extent. Though a very great number of birds decimate the caterpillars of *Dendrolimus pini*, yet here again the cuckoo distinguishes itself above all others. The golden oriole (*Oriolus galbula*) and the jay are also useful in this respect, and one instance is particularly reported where the former effectually checked the ravages of the caterpillars when they appeared in spring. In the case of most sawflies it again occurs that the cuckoo is nearly always the sole enemy of the larvae when the latter are feeding. When later on they are in their cocoons, other birds seek them out. In a small birch wood which had been nearly stripped by *Croesus septentrionalis*, 17 cuckoos appeared and cleared off all the larvae.

These are but a very few of many examples which prove the undoubted value of birds to the forester. That birds destroy useful insects and the parasites of insect pests is undeniable. In this connection it is mentioned that ichneumons are very seldom found in a bird's stomach, but this is only an exception to the general rule, which may sometimes render these feathered allies doubtful auxiliaries. In conclusion, the author points out that both spraying and fumigation destroy the parasite as well as the pest; that the cost of bird protection is low; that birds are able to hunt out concealed pests, some of which, as for instance the oak Tortrix, larch miner, the processionary caterpillar, *Zeuzera*, *Saperda* and wood-ants, are not amenable to mechanical control.

MORSTATT (H.). **Die Wanderheuschrecken und ihre Bekämpfung.** [Locusts and their control.]—*Flugblatt zum Pflanzer, Dar-Es-Salaam*, Dec. 1913, no. 7, 7 pp.

In German East Africa locusts only appear at intervals of several years, far less frequently than in countries farther south. They occurred in 1893, 1898, and 1903–1904, and one swarm alighted in West Usambara in 1905. On the 20th Nov. 1913, shortly before the beginning of the monsoon, some scattered swarms were observed in Usambara, coming from the north-east. They come from the interior of the continent and belong to the yellow or Egyptian species (*Schistocerca peregrina*, Oliv.). Regarding control, the methods and formulae given are those in use in South Africa. Full reference is made to the work at one time carried on by the South African Central Locust Bureau and now performed by the Bureau of Entomology, Pretoria. The paper concludes with a bibliography.

MARTELLI (G.). **Prime esperienze in Italia sull'impiego dei vapori di acido cianidrico contro le Cocciniglie dannose.** [First experiments in Italy with hydrocyanic acid against Coccids.]—*Giorn. Agric. Merid., Messina*, vi, nos. 10-11-12, Oct.-Nov.-Dec. 1913, pp. 169-174.

In Sicily the closeness with which the lemon trees are planted leads to the entangling of their branches, so that fumigation with hydrocyanic acid—the most powerful control known in the United States and Spain—appeared impracticable. An opportunity of testing this method having occurred, the author found that many of the difficulties apprehended did not exist. In fact, the occasions on which the fumigation tent could be used were fairly numerous, as in the case of young trees, trees which have been radically pruned, and trees growing in groups of three or four. The cost of this method has not been worked out, but as the effect of a single fumigation lasts for two years, the author believes that under certain conditions of co-operation among the Sicilian growers, economy may be expected. There is no doubt as to its efficacy. Comparative examination showed that of several hundreds of Coccids found on fumigated plants 97·3 per cent. were dead, whereas only 10·3 per cent. had died from natural causes on plants which had not been treated.

MARTELLI (G.). **La *Thea* 22-*punctata*, L., è solamente micofaga.** [*Thea 22-punctata* is exclusively mycophagous.]—*Giorn. Agric. Merid., Messina*, vi, nos. 10-11-12, Oct.-Nov.-Dec. 1913, pp. 189-195.

*Thea 22-punctata* is an abundant ladybird in all parts of Sicily. In June it completes its cycle in 19-21 days, while in August this takes 24-28 days. According to these figures seven generations may occur from May to October. The author finds that neither the adult nor the larva feeds on aphids, and if aphid-infested leaves or twigs are fed to them they die of starvation. They feed on the conidia and spores of various species of *Oidium* found on the pumpkin, *Plantago* sp., *Beta vulgaris*, various *Brassicaceae*, the oak, the hawthorn, *Clematis vitalba*, *Euonymus* sp., and the vine. The adult is also able to use the sugary substances excreted by the leaves of some plants and the larva sometimes sucks the eggs of *Thea* itself. The author thus establishes the fact that *Thea 22-punctata* is normally mycophagous.

Rondani recorded the Dipteron *Aphiochaeta* (*Phora*) *fasciata*, Fall., as a parasite of *Coccinella 7-punctata*, L., and the author has found it killing *Thea 22-punctata*, and also attacking *Adonia variegata*, the active enemy of the yellow-green aphid of the capsicum. The chief enemy of *Thea* is *Homalotylus flaminius*, Dalm., a Hymenopteron already known as parasitising other Coccinellids. *Homalotylus* may infest up to 38 per cent. of *Thea* larvae.

THIELE (H. H.). **Coconuts in Fiji.**—*Trop. Agric., Peradeniya*, xli, no. 6, Dec. 1913, pp. 458-462.

Coconut cultivation on the island of Viti Levu was practically given up many years ago, owing to the serious injury done to the leaves by a small moth, *Levuana iridescens*, B.B., not hitherto found elsewhere. Since the end of 1912 a change has taken place in the appearance of the coconuts in most parts of the island and the author thinks the chance of combating the pest successfully has now considerably increased. No control measures are given in the paper.

RUTHERFORD (A.). *Zeuzera coffeae* (**Red Borer; Coffee Borer**).—*Trop. Agric., Peradeniya*, xli, no. 6, Dec. 1913, pp. 486-488.

This insect is widely distributed in Ceylon as a pest of tea. Its presence is indicated by the withering of the leaves and by castings ejected by the caterpillar from its burrow. These castings are oval-cylindrical in shape and yellowish or crimson in colour. If one of the attacked branches is cut open, a tunnel, widening out at irregular intervals, will be found running along its centre. These wider portions are of the nature of lateral galleries that may reach almost to the outside. The width of the tunnel depends on the age of the caterpillar, and the galleries of the young larvae are usually straight. The galleries may be so extensive as to girdle the stem; they may also go down into the roots. When full-grown the larva cuts a circular trap-door for the exit of the moth. A variety of insects has been found in the tunnels and in some cases they have been mistaken for the real culprit.

The *Zeuzera* has been found feeding on the following plants in

Ceylon :—Tea, coffee, loquat, cotton, avocado pear, "china apple," orange, Grevillea, teak, *Cassia auriculata*, cinnamon and *Erythroxylon*. In India it is recorded from tea, coffee, sandal and cotton. Being a general feeder it is difficult to deal with. Affected branches should be cut down until untunnelled wood is reached and the larva or pupa in the tunnel killed. Sometimes, as when the tunnel goes below the ground or into the body of the bush, this is not possible. In such a case the pruning should be carried as low down as possible, and the tenant of the gallery killed by prodding with a sharp wire or by putting into the gallery a piece of cotton wool saturated with carbon bisulphide and closing the hole with clay.

RUTHERFORD (A.). **Mites.**—*Trop. Agric., Peradeniya*, xli, no. 6, Dec. 1913, pp. 490-494.

Dry, finely-divided sulphur has been regarded as a specific against mites, but recent work in the United States shows that is not so in all cases. Dealing with the red spider (*Tetranychus bimaculatus*, Harvey) it was found that "sulphur is effective only when the infested surfaces of the plant are exposed to direct sunshine at some time during the day, or to intense reflected heat." In Ceylon, where sulphur gives good results, one or other of these conditions is usually satisfied. Dry sulphur should be applied when the leaves are wet with dew, or, failing this, they should receive a preliminary spraying with water ; preferably there should be no wind at the time of application. In Ceylon the cost of applying sulphur at the rate of 10 lb. per acre, preceded by a spraying with water, has been found to be about 2*s*. 4*d*. per acre. Sulphur is now applied in California along with hydrated lime (which may be prepared by adding 32 lb. of water to 100 lb. of quicklime) as the latter causes the sulphur to adhere to the leaves, and also acts as a carrier. The nozzle should throw a washing, rather than a misty, spray. The pressure must not be less than 120 lb. and angle-nozzles or bent rods are necessary in the case of mites infesting the under surfaces of leaves. The Yellow Tea Mite (*Tarsonemus translucens*, Green) is probably the most common and most injurious of the mites affecting tea in Ceylon. It is most abundant on the underside of the leaves, where the small whitish eggs and the mites can be seen even with the unaided eye. The mite occurs chiefly on the two or three leaves nearest to the unopened buds, but also on the latter, on the young stem, and, sparingly, on leaves below the two or three that are most heavily infested. Green records this mite as badly attacking *Cosmos sulphurea*, a composite, and the author has seen the same, or a very closely allied mite, in injurious numbers on leaves and young stems of a small solanaceous climber (*Solanum venustum*). The leaves become bronzed and withered and frequently drop off. This plant was exposed to the full rays of the afternoon sun.

Mites of this group are usually vegetable feeders and many are of great economic importance. *Tarsonemus oryzae*, Targ.-Toz., causes a disease of rice known as "bleaching" in Italy. *T. spirifex*, March., produces distortion in the panicle of oats in France and Germany. *T. waitei*, Banks, is associated with a peach-bud disease in the United States. *T. bancrofti*, Mich., injures sugar-cane in Barbados* and is

[*The Barbados form has been described as a distinct species, *T. spinipes*, Hirst (*Bull. Ent. Res.* iii, 1912, p. 325).—ED.]

present on sugar-cane in Queensland. *T. ananas*, Tryon, is the forerunner of a disease of pine-apples known as "fruitlet core rot" in Queensland. *T. culmicolus*, Reuter, causes a disease of grasses in Finland. *T. latus*, Bks., was found injuring mango plants in Washington. *T. approximatus*, Bks. MS., and *T. assimilis*, Bks. MS., have been taken on Citrus in California. *T. buxi* is stated by Green to have destroyed every box-tree in the Botanic Gardens at Turin in one season.

The ribbed tea mite, *Phytoptus carinatus*, Green, is recorded in Ceylon from Kegalle, Ukuwela, Nuwara Eliya, Haputale, Peradeniya, Gonakelle and Passara. A bush badly attacked by this mite has every leaf, except the young flush, of a whitish green or a deep bronze-colour, resembling those of copper beech, the discoloration being more marked on the upper surface. The mites are very minute. Watt and Mann give the distribution of this mite as Assam, Darjeeling, Duars and Ceylon.

Schneider-Orelli (O.). **Von der Blutlaus.** [The Woolly Aphis (*Schizoneura lanigera*, Hausm.)].—*Schweiz Zeits. für Obst. -und Weinbau, Frauenfeld*, xxii, no. 23, 10th Dec. 1913, pp. 354-360, 6 figs.

In 1909, Börner stated that the woolly aphis does not normally lay its winter eggs on apple-trees, but on another host-plant, then unknown. In 1912, Dr. Edith Patch obtained direct proof that this insect changes its host-plant, and she was led to conclude that the woolly Aphis (*Schizoneura lanigera*) and the American elm-leaf aphis (*S. americana*) are not specifically distinct, but simply different stages in the development of a single species [cf. this *Review* A, i, p. 24]. According to this, in the United States the winged forms of the woolly aphis migrate in autumn to the American elm (*Ulmus americana*), where the sexual forms and the winter-eggs are produced. In spring the newly hatched insects and their young suck the elm leaves and cause the characteristic gall formation. Early in the summer the winged forms appear, and return to the apple and similar trees, there parthogenetically producing colonies of woolly aphis. In Europe the American elm is very rarely available for this change, but European species (*U. campestris*, *U. effusa*, *U. montana*) abound, and on all of them—especially on *U. campestris*—galls like those observed by Dr. Patch are often found. But these galls and their producer (*S. ulmi*) have been known since the middle of the 18th century, long before the woolly aphis appeared. Another point which shows that the two forms are distinct is that Mordwilko and Tullgren have proved that *S. ulmi* regularly migrates to the roots of the currant and gooseberry and there produces colonies of white woolly individuals; further, Dr. Patch has recently stated that the antennae of the woolly aphis (including the American elm-aphis) differ considerably from those of the European elm-aphis. This statement is confirmed by the author, who is satisfied that the European elm-aphis (*S. ulmi*) is a different insect from the woolly aphis of the apple. It remains to be ascertained whether in Europe the woolly aphis passes the whole of its life-cycle on apple, or whether it does actually migrate to elms. To decide

this point definitively winter-eggs must be obtained and the larvae which hatch out in spring must be placed on European and American elms, and also on apple-trees. Details are given of some experiments carried out by the Experiment Station at Wädenswil with the object of breeding winter-eggs for infection tests. The result of these experiments was that about 500 winged individuals produced 200 females and 70 males, which in turn have given as yet 42 living winter-eggs. Though not especially favourable, this is satisfactory when compared with former attempts.

MOORE (B. A.). **The Wheat Louse** (*Toxoptera graminum*).—*Agric. Jl. Union S. Africa, Pretoria*, vi, no. 3, Sept. 1913, pp. 482-492, 12 figs; vi, no. 5, Nov. 1913, pp. 767-772; vi, no. 6, Dec. 1913, pp. 973-977; vii, no. 1, Jan. 1914, pp. 50-60.

In South Africa the first record of the wheat louse is in the 1903–04 report of the Manager of the Potchefstroom Experimental Farm, but according to old farmers the pest had been present for many years before. It is generally distributed over the wheat-growing districts having an altitude of between 3,500 and 5,000 feet. In South Africa there seem to be but two forms of the insect, namely, the winged migratory females and the apterous females; males and oviparous females have not been seen.

All the individuals of the wheat louse reach maturity in about seven days from birth and produce young without fertilisation. During summer the louse lives about 32 days, producing, under favourable conditions, three young daily for a period of 25 days. These are the conditions in the wheat fields about August, September and October. About the end of October or the beginning of November the grain, approaching maturity, becomes too tough for the wheat louse. By this time the winged females have developed, leaving the grain and seeking out grasses upon which they can spend the summer when no cereals are available. If, as a result of drought, there is no grass, the great majority of the aphids die; but some of them are saved by a common ant, *Plagiolepis custodiens*, Sm., which carries them off and places them on the underground stems or roots of the grasses on which they can live. Here they are tended by the ants, which are repaid by honeydew secreted by the aphids.

The wheat louse may be found upon wheat, oats, rye, or barley; during winter it occurs on the main cereal crop, during summer on stray plants. If there are no cereal crops in winter, the louse is found on fescue grass (*Bromus willdenowii*). During summer it frequents different grasses, such as Johnstone grass (*Sorghum halepense*), goose-grass (*Eleusine indica*), sweet grass (*Panicum laevifolium*), teff grass and millet; C. P. van der Merwe mentions also kweek grass (*Cynodon dactylon*) as a host plant. The louse has not been found on *Paspalum dilatatum*, even when growing side by side with infested Johnstone grass.

In the United States a very small Braconid wasp (*Aphidius testiceipes*) successfully controls the wheat louse. In South Africa several species of *Aphidius* occur, one of which multiplies rapidly under favourable conditions. Should the wheat louse not be abundant in the field, the *Aphidius* is able to breed in certain other species of aphids, but directly

the *Toxoptera* become more abundant the *Aphidius* returns to them. An important predaceous insect is the black-spotted ladybird (*Adalia flavomaculata*), which during the larval and adult stages feeds on *T. graminum* and a large number of other aphids; the red-spotted ladybird (*Chilomenes lunata*) and the black ladybird (*Exochomus nigromaculatus*) are also important predators. Of the several different species of Syrphid flies, the larvae of which feed upon *T. graminum*, *Xanthogramma scutellare* is the most important. The lace-wing flies (*Chrysopa* sp.) are of less value. The ladybirds and Syrphids are themselves attacked by parasites; the former by a Braconid wasp (*Dinocampus* sp.) and a Chalcid (*Homalotylus* sp.), the latter by an Ichneumon, *Bassus laetatorius*. The Syrphid is of considerable value as it is the first enemy to appear in an infested field. Owing to the abundance of ladybirds, the value of the *Aphidius* is not so great in South Africa as in America. A ladybird will destroy a given number of wheat lice in a shorter time than will the *Aphidius*, but while it is feeding on the lice it is also destroying the *Aphidius*. After the work of all the parasites and other enemies, a few individuals or colonies of the aphis remain to carry on the species. On Johnstone grass the individuals underground always furnish a source from which new colonies can be formed, and the insects are able to pass through the summer successfully, although greatly reduced in numbers. Under cold conditions, however, the balance is in favour of the wheat louse. The *Aphidius* may be neglected as a means of control below a mean of 55° F., while the louse is still breeding well as low as 50° F., and is not greatly retarded until a mean temperature below 40° F. is reached. Of the ladybirds, the effect of cold seems to be greatest on the *Exochomus*; the *Adalia* withstands the cold much better than either of the other two and is quite active at 50° F. Adult Syrphid flies can almost always be found all through the winter, though they breed very slowly, and their parasite (*Bassus*) persists with them.

As a general rule aphids can be controlled by spraying the plants with paraffin emulsion or tobacco extract and soap, but since a field sprayer would have to be used, this entails a large expenditure which would practically take all the profit on the wheat. On this account the main measures should be directed to prevent the attack. The best prevention of a serious loss is irrigation, and where irrigation is not feasible the ground should be carefully prepared so as to conserve as much moisture as possible. The ground should always be rolled. Under irrigation, fertilisers can be used to make a strong healthy plant able to withstand the attack. Good rotten farmyard manure is the best fertiliser for this purpose, and the best results would be obtained if it were applied in the early spring. Barley is most severely attacked by the wheat louse in South Africa; rye could be better grown than barley, and the variety of oats known as winter oats is only slightly attacked by the louse. Of the varieties of wheat tested for resistance to the louse, "Spring Wheat," "Wit Klein Koren," "Russian Kubanka Durum," "Bombay" and "Minnesota" seemed the best. If an attack starts in one part of a field and the rest of the field is comparatively free, that area should be burned down. If such spots are promptly dealt with the whole field may be saved. The use of the brush drag or the roller is said to give good results, but it is doubtful if they are really worth the labour. Probably the best treatment of an

infested field would be to turn sheep into it and allow them to eat off the grain before it is too far gone. This would save the money expended on raising it to that stage.

Fuller (C.). **Locust Campaign, Cape Midlands, 1913.**—*Agric. Jl. Union S. Africa, Pretoria*, vii, no. 1, Jan. 1914, pp. 30-34.

During the early part of the year a few unimportant swarms of migratory locusts were reported from the Cape Midlands. It was found that two different locusts were involved, the true migratory locust, *Locusta pardalina* (*Pachytylus sulcicollis*), and a not particularly harmful species, *L. danica*. The farmers were urged to notify any egg deposits, and reports were received from between sixty and seventy farms. Till the 1st November there was every prospect of a successful issue of the campaign, but by this time it was obvious that the outbreak was far more serious than had been anticipated. Greater success might have been achieved had all concerned taken interest in the work. The locusts then coming to wing largely escaped the attack of locust birds, thus increasing the difficulty. Investigation also showed that the majority of locusts hatched from eggs deposited years previously. Complaints have been made that difficulty was experienced in obtaining poison, but in no case was a depôt further than fifteen miles from a locust-infested farm. The most serious fault has been found with the limited issue of poison arranged for; at first two drums were given to an applicant, but very soon the officers in charge were authorised to issue poison at their discretion. The ineffectiveness of the poison was also a matter of complaint, but investigation showed that the solution had not been properly stirred and as a result a liquid under strength was used, leaving the heavier arsenic compound at the bottom of the drum. The farmers are again urged to co-operate with the Government and report every locust movement.

**La Protección a los pájaros útiles a la agricultura.** [The protection of birds useful to agriculture.]—*Revista agricola catalán de San Isidro, Barcelona*, 1913, 69 pp.

This pamphlet is issued by the Provincial Board of Agriculture of Barcelona with the object of popularising bird protection, and stress is laid on the fact that the Chief Officer of the agricultural district of Catalonia reported in 1907 to the Board that the diseases affecting the "Algarroba" (carob bean) at Cambrils (Tarragona) could be avoided by bird protection. The value of reserves in ensuring the increase of birds forms the subject of one chapter, which contains the following figures from a paper presented in 1913 to the International Institute of Agriculture by the Hungarian delegate, M. E. de Miklos de Miklosvar, and dealing with the Hungarian State Preserves in 1911 and 1912. In 1911, the total number of nests was 5,005; of these, 2,077 (41 per cent.) were occupied by useful birds, 502 (10 per cent.) by sparrows, and 164 (3 per cent.) by animals other than birds. Thus it was estimated that some 14,000 useful birds would be bred that year. In 1912, 5,222 nests were inspected; 55 per cent. were found occupied and it was estimated that about 15,000 useful birds would be bred. The International Convention of 1902 is given in full. This

embodies lists of useful and harmful birds with the Latin and Spanish names. The Spanish law on the shooting of small birds is reprinted in extenso; this also contains a list of those species the killing of which is absolutely prohibited.

PHILBROOK (E. E.). **The Brown-Tail and Gipsy Moths.**—*Qtrly. Bull. Maine Dept. Agric., Augusta*, xii, no. 4, Dec. 1913, pp. 1-10, 5 pls.

An historical account is given of the measures taken against the gipsy moth in the New England States. During the years 1907 to 1913 inclusive, the State of Maine has expended 170,000 dollars on the work of suppressing this insect. The eggs are laid on almost any object in July and August, in a mass of 400 to 500, covered with yellowish hairs, looking much like a small piece of sponge. They hatch about 1st May, and the caterpillars are full-grown by about midsummer. Sometime in July or early August they pass into the pupal stage, which lasts about 10 to 14 days. The caterpillars will attack any fruit, shade or woodland trees, and, where abundant, destroy all green vegetation. Coniferous trees are killed after being once defoliated and deciduous trees usually die after four or five defoliations. In the orchard the gipsy moth is readily controlled by painting the egg-masses with creosote in winter and spraying the trees with arsenate of lead (10 lb. to 100 gals. of water) just as the eggs are hatching in spring. Banding has also proved of much value in the work against the caterpillars. Spraying, thoroughly and carefully done according to the rules given by the best authorities, will almost always give good results. If carried out carelessly much damage may be done.

The brown-tail moth is the worst of the imported pests. The home of this insect is in Europe, where it occurs over the entire country. It deposits from 200 to 400 small eggs thickly covered with a mass of brown hairs. The large majority of eggs are laid on the under surface of shade and fruit trees. Those laid in July hatch the following month, and the young caterpillars, feeding in a mass, soon commence spinning their webs, in which they pass the winter. To check this pest the webs on shade and fruit trees should be cut off and burned in the autumn or winter. Fruit trees are best sprayed with arsenate of lead (4 lb. to 50 gals. of water) as soon as the eggs hatch in the late summer. Banding the trees with tanglefoot will in some cases protect the foliage from harm. The native birds are of great value to the orchardist and farmer, since many have been observed feeding on the caterpillars of the brown-tail moth. Prof. Fernald states that toads devour the caterpillars during early summer, and the moths later in the season. Numerous parasites have been bred from this insect.

BÖRNER (C.). **Uber reblaus-anfallige und -immune Reben** .[On the susceptibility and immunity of Vines to the attacks of the Vine Louse.]—*Biol. Centralblatt, Leipzig*, xxxiv, no. 1, 20th Jan. 1914, pp. 1-8.

The author gives an account of experiments made by himself in Villers l'Orme, near Metz, by M. Bichon in Pagny, s. Moselle, and by Professor Autelin in Nancy, on the resistance of different vines to the attacks of *Phylloxera*. The most important result of these experiments is to show that the effect produced upon vines by the Lorraine louse

was quite different from that produced by the South of France form. From this the author has concluded that there are two species of vine louse; he has called that found in Lorraine *P. pervastatrix*. In the course of his experiments he proved that *pervastatrix* could not adapt itself to certain vines. According to their behaviour when attacked by this louse, cultivated vines are divided into four groups:—(1) Immune vines; (2) vines which are resistant, but which are subject to slight attacks; (3) vines whose leaves bear small, mostly sterile galls, but whose roots bear nodules and tubercles; they favour the development of the louse, but are to a certain extent resistant; (4) Susceptible vines, on which the normal galls are formed on the leaves and nodules on the roots, which favour the development of the louse and have no resistant power. The first class includes the following:—Pure strains of *Vitis riparia*, *V. rubra* and various hybrids such as *riparia* × *rupestris*, Conderc 3306, 3309, Geisenheim 107; *solonis* × *riparia* 1616a; Cabernet × *rupestris* 33a; *cordifolia* × *rupestris*, Geisenheim 19 and 20, etc. Immunity would appear to act as a Mendelian dominant and is transmitted when an immune species is crossed with one that is not immune; it is independent of outside factors such as temperature, moisture, season, and the food supply of the plant. The second class includes the following vines:—*aramion* × *rupestris*, Ganzin Nr. 1; Mourvèdre × *rupestris*, 1202; *riparia* × Gamay, Oberlin 595 and 604, *aramion* × *riparia*, Teleky 143 B, etc. Vines of the third class are the hybrids *riparia* × *rupestris* 101 (Bouisset, Geisenheim, Löhnberg, Richtee), 175 (Geisenheim); *riparia* × *vinifera* 44 (Laquenexy); *solonis* × *vinifera* 35 (Laquenexy); Madeleine royal × *riparia* 33 (Laquenexy). To the fourth class belong the majority of cultivated vines, particularly the European species of *Vitis vinifera* and *silvestris*, pure strains and hybrids of *Vitis labrusca*, the species of the American vines *Vitis berlandieri*, *cordifolia* and *monticola*, and many hybrids.

**Tea mosquito.**—*Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta,* Part 4, 1913, pp. 98-99.

A fumigating preparation known as sulphur-cake and produced in Hamburg is reported to have been highly successful against the tea mosquito (*Helopeltis*) in Java. When lighted, heavy fumes penetrate into the tea bushes. In view of this, an experiment was made on the Leesh River Tea Estate, but the results obtained were very disappointing. At the time of this experiment the bugs were beginning to spread over the area, and the sulphur-cakes do not seem to have checked them, for three weeks later the Manager wrote:—" .... the plot we experimented on is just as bad as the rest. The sulphur had no effect upon it."

Andrews (E. A.). **White ants.**—*Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta,* Part. 4, 1913, pp. 96-97.

A "Universal" white ant machine was found effective on an old colony of a mound-building species of termite which was killing out a Gold Mohur tree. The nest was some five feet in diameter and about the same in depth, and the roots on one side of the tree were entirely

eaten away. The nozzle was pointed down one of the holes, all others being stopped up, and the fumes from four tablespoonfuls of the special compound were pumped in for about half an hour. The nest was opened three days afterwards. For some distance into it a deposit of sulphur showed insufficient combustion, due to lack of air. The upper combs, which were swarming with termites before the experiment, had been completely deserted. The fungus which was cultivated by the insects on the combs was entirely destroyed. Deeper into the nest the combs were full of dead soldiers, workers and young, but some of the nymphs were still alive. The ants have not reappeared, and the tree is doing well.

Andrews (E. A.). **Shot-hole borer.**—*Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta,* Part 4, 1913, pp. 94-95.

*Xyleborus fornicatus*, the shot-hole borer of tea, confines its attacks to the sap-wood. The female bores directly into the wood and excavates a vertical tunnel with side branches. At each junction are deposited eggs, and the opening of the side branch is then covered up with a wad of damp saw-dust which produces the necessary conditions for the growth of the Ambrosia fungus, upon which the larva feeds. Its mouth parts are not adapted for chewing wood. The adult stays for some time in the larval gallery, which it lengthens, and in the case of small stems the sap-wood may be almost completely ringed. The chief damage is done by the tunnelling, which interferes with the flow of sap, and by the fungus, which ultimately causes the death of the tree. Dead, dying, or going-back trees are those attacked, and an examination of an infected bush will reveal some injury or disease. Pruning weakens the bushes and makes them more liable to attack. It has been suggested that various poisons, such as carbon bisulphide and benzene be poured into the holes ; or that the stem of the bush be painted with some mixture, one of the most recent suggestions being a mixture of chalk and glue in equal parts diluted with water. A layer of this asphyxiates the insects in the galleries and obstructs the laying of eggs. By placing upright poles in the ground among the bushes, the insects may be induced to leave the latter alone, and bore into the former, which can be destroyed. An effective preventive measure is to leave a few shoots unpruned to regulate the flow of sap during the pruning season ; and manuring, by making the woody tissues to grow more rapidly, tends to close up the tunnels, thus producing greater resisting power against the pest.

**The use of Formalin for disinfecting tea seed.**—*Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta,* Part 4, 1913, p. 107.

As a result of experiments undertaken with the idea of ascertaining the value of formalin against mosquito blight, it was shown that the formalin damaged the bushes when its strength was less than half that at which it killed the young bugs. This confirms the results of experiments made at University College, Cork, with formalin, against green fly and mealy bug, when " any efficacy formalin might possess as an insecticide was more than counterbalanced by its injurious action on the plants." [cf. this *Review* A, 1, p. 18.]

LOVETT (A. L.). **Insect Pests of Truck and Garden Crops.**—*Oregon Agric. Coll., Corvallis., Bull.* 91, (Exten. Ser. II, no. 5.) 1913, 39 pp., 13 figs

Truck-growing is followed on a commercial scale in limited areas of Oregon, and the total amount of injury to truck and garden crops by insect pests is enormous. Having the crop in a clean, thrifty, growing condition is the initial step, and the use of insecticides is essential to the highest production of first-class truck and garden crops. To be of most value sprays should be applied before the injury is apparent. The careful rotation of crops; autumn, winter and early spring ploughing; clean cultivation; care as to time of planting; the proper use of fertilisers; the use of trap crops; and the frequent examination of young plants for insect pests; these are all valuable measures.

Among general pests the cutworms (NOCTUIDAE) cause much damage. As a control measure is suggested late summer, autumn, or early spring ploughing, followed by frequent stirrings with the harrow. By thus keeping down all vegetation the caterpillars are starved out. Poisoned bran mash is the standard remedy for cutworms. This consists of 16 lb. of coarse bran, $\frac{1}{2}$ lb. Paris green, $\frac{1}{4}$ lb. salt and a quart of cheap syrup, mixed with warm water to make a coarse, crumbly mash, which should be spread broadcast over the field several days before the new crop is to appear. Small heaps of the mash may be placed about young plants, such as tomatoes, cabbages and melons. It is advisable to scatter the material in the evening so that it may remain moist for a longer time. Against grasshoppers (ACRIDIIDAE), the use of a disk-harrow or a renovator during late summer and autumn on grass lands adjacent to the truck fields would destroy many egg-capsules. The poisoned bran mash is as effective against grasshoppers as against cutworms, the former being especially fond of the salt in it. The tarnished plant bug (*Lygus pratensis*, Linn.) is a widespread pest. Many of these insects may be captured by sweeping over the plants frequently with an ordinary insect net. A 7 per cent. kerosene solution is very effective against the nymphal forms. Cleaning up fence corners, etc., during the winter and keeping down the weeds about the field are measures of special value for the control of this pest. The wireworms (ELATERIDAE) cause injury by eating the germ of seed grain and excavating tunnels in potato tubers, and other seeds, bulbs and root crops often suffer in a similar manner. As control measures, plough in late summer and harrow the ground frequently; rotate the crops, sowing the infested soil with a leguminous crop for a season or two; on restricted areas poisoned baits of bran mash may be placed under stones or boards about the field. White grubs (*Lachnosterna* spp.) girdle large roots and completely eat off the smaller ones, often killing the plant attacked. As a control measure, plough the soil to a good depth during the autumn, ordinarily from 1st to 15th October will prove the best time. Crop rotation is of some value, and chickens trained to follow the plough will pick up many grubs. Millepedes may cause much injury to garden and truck crops. The treatment recommended for wireworms should be of value. Dressings of a nitrate fertiliser, of salt or of rock lime, will probably be useful; and a soil dressing of 10 parts of sulphur and one part of

tobacco dust will repel them. Traps of sacking, boards, etc., as employed for slugs would be equally effective for this pest. The western potato flea-beetle (*Epitrix subcrinita*, Lec.) is the most serious pest of the potato and tomato in Oregon. The beetle eats small irregular holes in the leaf from the underside and these punctures induce the growth of a fungus. The larvae tunnel into the developing tubers underground and here also a fungus usually gains entrance. The beetle avoids sprayed foliage. Bordeaux mixture applied for the potato fungus acts as a very effective repellent for the flea-beetle. Arsenate of lead, 3 lb. to 50 gals. water, with the addition of $2\frac{1}{2}$ quarts of a good cane-syrup, is suggested as a spray. The under surface of the leaves must be thoroughly sprayed. Strips of paper suspended over the plants on a string stretched the length of the row are highly recommended by one grower. The stalk-borer (*Papaipe nebris*, Guen.) tunnels into the stalks of potato and tomato, eating out the heart. As a control measure, cut out infested stalks and burn them. The tomato worm (*Chloridea obsoleta*, F.), which burrows into the fruit, also attacks sweet corn. Direct hand methods are employed for its control. For the tomato aphis (*Marcrosiphum lycopersici*, Clark), rarely occurring in injurious numbers, contact sprays would prove effective.

The bean Bruchus (*Acanthoscelides obtectus*, Say) attacks the pods in the field and is also able to breed in the stored seed. The adult beetle deposits eggs in or on the pods in the field. The grubs hatch and burrow into the beans and are carried into storage. Weevily beans should not be planted, because the grubs will continue development and infest the new crop. A temperature of 145° F. will kill the beetle at all stages and will not injure the germination of the seed. Fumigation with carbon-bisulphide is the standard treatment for stored grain pests. The pea Bruchus does not breed in stored seed, but the losses due to it are very heavy. The adult beetles deposit eggs on the forming pods ; the grubs are mature at gathering time and pupate in the stored pea. If the seed is held over a season in a tight bin, the beetles will emerge and die. Kerosene at the rate of $\frac{1}{2}$ gallon to 5 bushels of seed is recommended. Pour the liquid over the peas, stir thoroughly, then spread the peas out so that the oil may pass off. The treatment recommended for the bean Bruchus is equally efficacious for this pest. For the pea aphis (*Macrosiphum pisi*, Kalt.) kerosene emulsion is possibly the best of contact sprays. The brush and cultivator method is used extensively on large commercial plantings in the south. The rows are planted sufficiently far apart to allow a single horse and cultivator to pass between. The insects are brushed from the vines during the heat of the day and the cultivator stirs them into the hot soil where they die. Another arrangement is a long shallow galvanised pan, which is drawn between the rows and the plant lice are brushed into it. The pan should be filled with water and a thin covering of oil added. Of the pests of the cabbage and radish crops in Oregon, *Phorbia brassicae*, Bouché, is the most serious. This insect also feeds on the turnip, cauliflower, celery, rape and kale. They pass the winter as maggots and pupae in and about the roots of their food-plants. The eggs hatch in from 4 to 10 days and the young maggots burrow at once into the tender plant. To check the pest gather and destroy all waste roots and refuse tops as soon as the crop is removed ;

plough the land to a depth of 4 inches or more; destroy all wild mustard and similar weeds about the field; rotate the crops so that cruciferous plants occupy the soil for not more than one season; the use of a quick-acting fertiliser and frequent surface cultivation are decidedly beneficial. Screening of the cabbage seed-beds is highly recommended by one authority. Five parts of sulphur to one part of tobacco dust, applied in the drill rows with the seed of radish and turnips gave good results. Lime and carbolic acid (1 gal. water, 3 pints milk of lime, and 1 tablespoonful of crude carbolic) applied to the surface soil acts as a repellent for this pest; 1 pint of kerosene to 3 gallons of sand is also recommended. Powdered tobacco placed about the plants at the time of planting and renewed every week has proved useful. White hellebore, 1 part, and air-slaked lime, 10 parts, applied as a dust to the surface soil gives very good results as a preventive. Another serious cabbage pest is the cabbage aphis (*Aphis brassicae*, L.). Contact sprays to be effective must actually wet the insect and several applications are often necessary. Destroy all old stumps and leaves, since it is in these that the aphids pass the winter. If plants are infested in the seed-bed they should be either dipped at transplanting time or fumigated. Whale-oil soap, 1 lb. to 8 gals. of water, makes a very effective dip and equally good is home-made fish-oil soap, the formula for which is caustic soda $1\frac{1}{2}$ lb.; water, $1\frac{1}{2}$ quarts; and fish-oil, $5\frac{1}{2}$ lb. For use, take 1 lb. of soap to 8 gals. of water, and dip only the infested parts. Infested plants dipped for 2 or 3 seconds in water heated to 122° F. showed that all the aphids were killed and the plants were uninjured. Kerosene emulsion as a 7 per cent. solution is possibly the best of aphis sprays. "Black Leaf 40," 1 part to 1,600 parts of water, with the addition of 1 lb. of whale-oil soap to 20 gals. of the solution has given excellent results. *Diabrotica soror* and *D. trivittata* attack cucumbers and melons and are also serious pests of beans, potatoes, turnips, etc. It is seldom that any one treatment will prove entirely effective. The "trap crop" method has given excellent results. Screens covered with cheese-cloth serve very well for the protection of small plants. Fine wire screen cones are also recommended. All old vines and trash in the field should be destroyed, as well as the wild gourd. For very small plants arsenicals as a dust should be used, and for older plants zinc arsenite, 1 lb. to 60 gals. of water, can be used as a spray. Lead arsenate paste, 3 lb. to 50 gals., is also good. The onion thrips (*Thrips tabaci*, Lind.) is becoming a serious pest in the onion districts. While onions suffer most, cabbage and kale, cucumbers, tomatoes and several ornamental plants are also subject to attack. The injury is due to a rasping of the surface of the leaf, which then wilts. "Black Leaf 40," 1 part to 1,600 parts of water, with the addition of whale-oil soap, 4 lb. to 100 gals. of the solution, will control the thrips; kerosene emulsion as a 7 per cent. solution is equally good. The onion maggot (*Pegomyia ceparum*, Bouché) attacks the onion much as the cabbage maggot attacks the radish, and similar control measures are effective for it. The paper concludes with a number of formulae for useful insecticides.

SAHILLE (E.). **Sobre el gusano de la peras y manzanas.** [The pear and apple worm.]—*Revista de la Asociación Rural del Uruguay, Montevideo,* Aug.-Sept. 1913, pp. 359-362.

The author states that in Uruguay the moths of *Cydia* (*Carpocapsa*) *pomonella* are best destroyed by bonfires lit in the evening around pear and apple trees when in blossom ; or again, a large box provided with apertures, containing a light and smeared inside with honey or syrup, makes an effective trap. Against the grubs the author recommends preventive spraying. As Paris green is expensive, the use of Scheele's green (copper arsenate) is suggested. As a poison it is equal to Paris green, and costs only half the price; being in extremely fine powder it very easily remains in suspension in liquids.

JACK (R. W.). **Two Ladybirds Injurious to Potato Plants.**—*Rhodesia Agric. Jl., Salisbury,* xi, no. 1, Oct. 1913, pp. 77-82, 1 pl.

Ladybirds are in general of great value to farmers, constituting a powerful control against scale-insects and plant lice. There is, however, one genus of ladybirds, *Epilachna,* of which all the known species are exclusively plant-feeders. In Southern Rhodesia two species, *E. dregei* and *E. hirta,* normally feeding on certain wild solanaceous plants, have caused serious damage to potato crops. The eggs are laid in clumps, varying from four or five eggs to upwards of thirty, on the under surfaces of the leaves. Here the larvae hatch and feed on the softer portions of the leaves, as do also the adults. The latter live over the winter and probably egg-laying commences as soon as the warm weather approaches. It is probable that only two broods develop on the potato crop in Rhodesia, the first being laid in December, the adults appearing about the end of January; the second brood maturing early in March. If food is available in November three broods can doubtless mature. There is no doubt that potato diseases are spread and assisted by these insects.

Turkeys, when experienced in the work, are reported to be very effective in destroying this pest in the field. Much good can be done by killing the beetles by hand. On a larger scale spraying with an arsenical compound is the most effective remedy. The arsenic may take the form of arsenate of lead, 3 lb. to 50 gals. of water ; or Paris green 1 lb., quick or fresh water-slaked lime 2 lb., water 160 gals. ; or arsenite of lime, which is by far the cheapest arsenical spray in Rhodesia, and as effective as the others. Arsenite of lime can be prepared from arsenite of soda and quick or water-slaked lime. The formula is, arsenite of soda 4 oz., lime 11 lb., and water 50 gallons. The arsenite of soda is best dissolved in a little boiling water and made up to 25 gallons in one barrel. The lime is then slowly slaked and made up to 25 gallons in another barrel. The arsenite solution can now be added to the lime water and the whole stirred thoroughly. The lime solution should be strained. A hundred gallons of a mixture of arsenate of lead to be effective costs 7s. 6d., while a hundred gallons of arsenite of lime costs only 8d. This latter mixture should be kept stirred during use.

**Importation of Plants Regulations; Government Notice no. 259 of 1913, 21st Aug. 1913.**—*Rhodesia Agric. Jl., Salisbury,* xi, no. 1, Oct. 1913, pp. 180-185.

The regulations made in this notice cancel previous regulations and apply generally to any plant imported into Southern Rhodesia. The regulations declare that any plant or packages of plants may be examined by an Inspector, and when deemed necessary as a precautionary measure against the introduction of any insect pest, may be treated by the Inspector at the expense of the consignee or addressee, an examination fee of 1s. per each class of plant included in a consignment will be charged, and 5s. for each use of the fumigating chamber. If the Inspector considers it necessary, the package may be destroyed, no compensation being paid. After the examination a certificate will be issued for the package which must be produced at any time if required. One clause forbids the introduction into Southern Rhodesia of any plant from places outside British South Africa, except by post or through the port of Umtali or the ports proclaimed under section 8 of the "Agricultural Pests Act, 1911." No person may introduce into Southern Rhodesia from any place outside British South Africa any eucalyptus, acacia or coniferous plant or any living portion thereof with the exception of seeds; any stone-fruit tree or any living portion thereof which was grown or produced in any part of North America in which either of the diseases known as peach yellows or peach rosette exists; any live peach stones; any stone-fruits in their fresh state; any stocks whatever except those of the following, which may be imported in bulk only, that is not less than 1,000—almond, pear, plum, persimmon, cherry, Northern Spy and other apple stocks accepted as being resistant to the attack of woolly aphis (*Schizoneura lanigera*). The introduction of grape vines or other plants of the family Vitaceae, sugar-cane, plants cultivated for the production of rubber, tea plants and coffee plants, shall be made under the direct supervision of the Government; this limitation shall not apply to the seeds or fruit, except those of coffee. Any flowering or ornamental plant or any cotton seed may be introduced with special permission of the Director of Agriculture. The introduction for any one person shall be limited to 100 trees and 1,000 cuttings. Potatoes may not be introduced into Southern Rhodesia from outside British South Africa, unless duly certified and accompanied with particulars as to the place in which they were grown, etc.

Miatello (H.). **Enfermedades del ciruelo.** [Diseases of the plum-tree.]—*Gaceta Rural, Buenos Aires,* xii, no. 76, Nov. 1913, pp. 333-337, 7 figs.

*Diaspis pentagona* is one of the enemies of the plum-tree in the Argentine and is best combated with lime-sulphur or "acaroina." Two applications are required during the winter, in May and in August, and in spring, spraying must be effected on the appearance of the larvae. The acaroina solution (10 to 15 parts of acaroina mixed in 100 parts water until emulsification takes place) is preferable to lime-sulphur because of its greater wetting power; it also kills the insect

instantly. It is best applied in June, and spraying must be done on the same day as the emulsion is made in order to ensure uniformity. To control *Scolytus rugulosus* efficiently the parts attacked must be removed and burned; if the whole tree is infested it is best to root it up and burn it. *Cydia funebrana*, commonly known as the plum worm, may be dealt with by gathering the fallen fruit and feeding them to pigs.

**La falsa tiña de las colmenas.** [The bee-moth.]—*Gaceta Rural, Buenos Aires*, vii, no. 77, Dec. 1913, pp. 463-464.

The damage done by bee-moths increases with the heat and dryness of the breeding season. During the day they settle near the hives and at sunset fly round them; it is thus easy to collect or to net them. In 1902, bee-keepers in the district of Yerua lost 80 per cent. of their hives. If the trouble is severe it is best to remove the bees and fumigate the infested hives with sulphur.

Norris (F. de la Mare). **Locust work in Selangor; Progress Report for October.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 5, Dec. 1913, pp. 124-125.

In the neighbourhood of Kajang the swarms were comparatively small and scattered, and the district was practically free from hoppers by the 20th October. During the month of October approximately 465 kerosene tins of locusts, representing about 101 swarms, were destroyed. Around Kuala Lumpur the swarms were large, the apparatus being barely sufficient to cope with them. Considerable damage of a temporary character was done to gardens and hedges. By the 28th October few hoppers were present. The month's catch was 1,820 tins, representing 83 swarms in all. In the Ulu Selangor district swarms were large and in situations where they were difficult to deal with, but very satisfactory results were obtained and it is believed the locusts in this neighbourhood have received a check which materially decreases the possibility of their threatened advance into Perak. The chief centres of work were Rasa, Batang Kali, Bukit Chondong, the Kuala Selangor road, and Serendah. By the end of the month the work was finished; the catch being 3,030 tins, representing 50 swarms. In addition to this work done by the Special Assistant and the Government coolies, the Malays caught approximately 12,000 tins of hoppers for a reward of 1s. 2d. per tin, in this district. In a table showing the work done from 6th August to 31st October the total number of swarms dealt with in Ulu Selangor, Kuala Lumpur and Ulu Langat is given as 392, the total catch amounting to 24,753 kerosene tins.

Nonell y Comas (J.). **Las plagas de los Alcornocales en la Provincia de Gerona.** [Cork tree pests in the Province of Gerona.]—*Rev. Inst. Agric. Catalán S. Isidro, Barcelona*, lxii, no. 23, 5th Dec. 1913, pp. 355-358, and Monograph.

*Lymantria dispar* and *Coroebus undatus*, the two most serious pests of cork plantations in Spain, have been studied by a commission

which visited first the plantations of Romañá and other townships of the Selva and then proceeded to Darnius y Agullana on the frontier. In this article an address given by one member of the commission, Don Jaime Nonell y Comas, is freely quoted, while the Monograph contains a full record. *L. dispar* lays about 500 eggs in sheltered places on the branches and covers them with hairs from its abdomen. The eggs remain throughout the winter, and hatch in April and May. For 7 to 10 days the young caterpillars remain motionless, grouped together in large numbers; they then become active and extraordinarily voracious until the beginning of July, when they spin an imperfect cocoon in the rugosities of the bark. The adults emerge about three weeks later and shortly afterwards the females lay their eggs. The enormous voracity of the larvae is responsible for the rapid defoliation of the trees attacked, those preferred being the evergreen-oak, oak, cork-tree, plane-tree, and fig-tree. *Coroebus undatus*, a beetle of the family BUPRESTIDAE, appears between the middle of June and the middle of July. A few days afterwards the female lays her eggs in cracks in the bark of the lower trunk and roots. The larvae bore inwards and establish themselves beneath the last-formed corky layer. After personal observation Señor Nonell y Comas does not agree with those agricultural entomologists who hold that the life-cycle of *C. undatus* lasts a year; according to him it lasts two years. In the second fortnight of August the larva penetrates the liber and provokes an extravasation of sap through its gallery. This causes a black spot on the exterior of the trunk. The discoloration may only be temporary, but if the flow is abundant the sap spreads between the mother bark and that last formed and causes the latter to lose its good qualities. These spots were found to be a sure indication of the presence of the insect. It is hoped that the knowledge acquired may prove of use in reducing the ravages of these pests by leading to an encouragement of their natural enemies. Bird protection is an important point.

FEYTAUD (J.). **La Cochenille de San José.** [The San José Scale.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xii, no. 6, Dec. 1913, pp. 174-178, 2 figs.

Although the San José scale has not yet been found on trees in France, the author thinks it well to be on guard against this highly polyphagous pest. Fortunately *Aspidiotus perniciosus* has many natural enemies, such as the Coccinellids, *Microweisea misella* and *Chilocorus similis*; the parasitic Hymenoptera, *Aphelinus fuscipennis*, *A. mytilaspidis*, *Aspidiotiphagus citrinus*, *Anaphes gracilis*, *Prospalta aurantii*, *Ablerus clisiocampae*, etc., and the fungus *Sphoerostilbe coccophila*. Efficacious control methods are known, but they are difficult to apply to all the trees attacked. In the case of badly-infested and injured trees uprooting and burning is the only radical measure. The lime-sulphur formula given contains 5 parts by weight of quicklime, 3 of sulphur, and 100 of water. Hydrocyanic acid is mentioned as being very efficacious, but requiring costly apparatus and difficult to apply. Some Coccids native to France might be taken for *A. perniciosus*. According to Dr. P. Marchal they are: (1) *Aspidiotus ostreaeformis*, very common in France and abundant

on fruit trees near Paris; (2) *Diaspis ostreaeformis*, which is less frequent; (3) *Mytilaspis pomorum*, which may be very injurious to apple-trees.

**Concorso per un rimedio contro le tignuole della vite.** [Competition for a remedy against the vine moth.]—*Riv. Vitic. Enol. Agrar. Conegliano*, xix, no. 23, 1st Dec. 1913, pp. 541-547.

The prize of £24 was competed for by four entrants, the application and results of whose methods were inspected by a jury composed of five experts, one being the representative of the Ministry of Agriculture. The first competitor used two ordinary soft clothes-brushes, one being held under the bunch of grapes which is lightly tapped and stroked with the other brush. Ninety per cent. of the larvae in the webs are wounded by the bristles and the webs disappear from the grapes. Two women can clean 1,700 vines in a 7–10 hours' day. Their labour costs 3*s*. 4*d*. per day at the rate of 1*s*. 8*d*. each, and the outlay for the brushes is nominal, as the wear is insignificant.

The second competitor powders all the bunches with copper sulphate at a strength of 10 per cent., which he calls "Antisettico." The application must be made in the second half of May. Its object is to keep the moths away from the grapes, thus preventing eggs from being laid on them. The succeeding treatment consists in dipping all the bunches marked with the webs of the vine moth into a glass containing an "antiseptic" solution invented by the competitor. This operation is performed after the flowers have been fertilised and immediately the corolla has fallen. Towards the end of July the powdering is repeated on the appearance of the moths of the second generation. A quart of the liquid, sufficient for about 1,100 vines, costs about 11*d*. and it is non-poisonous. Including labour, the costs would amount to about 5*s*. when compared with the first method. The cost of the powder is not included, for it contains sulphur and copper and thus serves also to combat peronospora and oidium. One hour after immersion all the larvae were dead, and on inspecting the grapes some time afterwards these were found to be uninjured by the solution

The third competitor used lead arsenate, but instead of spraying, he dipped the bunches in a 2 per cent. solution. This was done on the 8th June, when the larvae had appeared, but had not yet enclosed themselves in their webs. On 19th June the jury could find no trace of either larvae or webs on the vines treated, whereas both abounded on the untreated ones. To be effective the operation must be carried out on the first appearance of the first larvae. Using the same labour as before the comparative cost would be about 6*s*.

The fourth competitor employed a special powder called "Arxolea," which is supposed to be effective against peronospora, oidium, and the moths. No Bordeaux mixture or sulphur was used in the experimental plot, but its condition was found equal to that of vines treated with Bordeaux mixture and copper sulphate. As regards the point under investigation—the control of the vine moth—there appeared to be no difference whatever between treated and untreated vines.

The conclusions arrived at by the jury are as follows:—(1) The methods of the first two competitors are efficacious against the larvae

of the first generation, but they cannot prevent these from damaging the flowers, because they can only be applied after flowering. The first method appears cheaper and quicker than the second. (2) The method of the third competitor gives good results against the larvae of the first generation, provided it be applied at the proper time, that is, before the larvae enclose themselves in their webs. Its disadvantage is however the poisonous nature of the liquid and the danger to which it exposes the user. (3) The "Arxolea" of the fourth competitor has neither a preventive nor a curative action on the moth. (4) None of these methods against the larvae of the first generation have influenced succeeding generations, and it may be assumed that in August the treated and untreated grapes were equally attacked. The prize was not awarded because no system can be efficacious unless it protects the young fruit as well as the flowers. It is suggested that the experiments be repeated on a larger scale next year, when any effect on the larvae of the second generation would be apparent.

Tairov (V. E.). **Изъ исторіи филлоксернаго вопроса въ связи со введеніемъ американской лозы въ Россіи.** [History of the *Phylloxera* question in connection with the introduction of American vine-stocks into Russia.]—*Odessa* (?), N.D., 18 pp.

The author reviews the history of *Phylloxera* in Europe, with special reference to the importation of American vine-stocks with a view to the production of *Phylloxera*-proof vines. As to Russia, *Phylloxera* was first discovered in 1880 in the western part of the south coast of the Crimea; in 1881 it appeared in Caucasia, in the vineyards near Suchum; and in 1886 it was also noticed in Bessarabia. It was established that both into Crimea and Bessarabia the pests were imported with vine-stocks obtained from Erfurt at the beginning of the 'seventies of last century. For a long time many Russian experts, principally Prof. A. O. Kovalevsky and I. A. Portchinsky, were amongst the opponents of the introduction of American vine-stocks into Russia, and they advocated radical remedies, aiming at the destruction of the pest; the Russian Government was also unfavourable to this new remedy, and it was only in 1892 that the official view on the subject underwent a change, and the prohibitions against the importation of foreign vine-stocks were gradually withdrawn.

In Bessarabia, where some years ago vineyards occupied an area of about 20,000 acres, more than one-third of them were suffering from *Phylloxera* in 1907. The first experiments with exotic stocks were started there about 15 years ago, and at the time of writing (?) it is estimated that only about one-tenth of the vineyard area in that Government is attacked. In the Government of Cherson some 1,300 acres are affected by *Phylloxera*; the growing of American vines started only a very few years ago, although in one part they were introduced in 1896. The Government of Taurida is still free from *Phylloxera*; American vines were introduced some 20 years ago, but some of the nurseries were afterwards abandoned. In Bessarabia and Cherson the Zemstvos assist the population by importing young stocks and distributing them amongst the vine-growers on easy terms, by securing the services of special vine instructors, by keeping experimental nurseries, etc. The author, who from the very beginning was an advocate of exotic vine-stocks as the best remedy against *Phylloxera*,

urges the necessity of their more extensive use, in order to save the vine-growing industry, especially in Bessarabia and Transcaucasia, from the losses caused by this pest. He also recommends the foundation of special schools for vine-growers, of vintage stations, etc.

MUNRO (J. W.). *Tinea tedella*, Cl., **in Aberdeenshire.**—*Entomologists' Monthly Magazine, London,* 2nd series, no. 289, Jan. 1914, p. 15.

The moth, *Tinea tedella*, Cl., is proving harmful to young spruce trees in Haylehead Woods, near Aberdeen. The larvae eats into the needles at the tips of the side-shoots and sometimes spins them together.

HILBERT (R.). **Über das massenhafte Auftreten von** *Coccinella quinquepunctata*, L. [Appearance of large numbers of *Coccinella quinquepunctata.*]—*Zeits. für wissen. Insektenbiologie, Berlin,* x, no. 1, 20th Jan. 1914, p. 32.

The author records the finding of numbers of specimens of *Coccinella quinquepunctata*, L., in the autumn of 1912 along the Sämland Coast, and also on the banks of the Spiedingsee. The reason for the presence of the beetles in such large numbers in these situations is quite unaccountable, as weather conditions during the summer had been, so far as can be judged, unfavourable to insect life, and there was no evidence of a particularly abundant food supply. The author refers to Prof. Werner's records of the finding of similar numbers of *Coccinella septempunctata* and *C. convergens* [see this *Review*, Ser. A, i, 1913, p. 548].

TRÄGÅRDH (I.). **Om lönnvecklaren** (*Tortrix forskaleana*, L.)—*Meddelanden från Centralanstaltens Entomologiska Avdelning, Uppsala,* no. 15, 1914.

A review of the literature leads the author to the conclusion that the larva of *T. forskaleana* has been confounded with that of *T. bergmanniana*, probably owing to a misinterpretation of a statement of Boisduval. Of all authors dealing with this species only Wilkinson and Wallengren give a correct description of it, all the others quote the incorrect description of Bouché. From this mistake arose the statement that *forskaleana* attacks roses, which the author is inclined to disregard, as no one of the authors who give this food-plant appears to have a real knowledge of the larva. The food-plant is the maple, the leaves of which are rolled by the larva. The life-history takes, in the neighbourhood of Stockholm, the following course. The larvae were observed in the end of May, pupated the 10th of June, the first moths appearing the 8th of July ; there is only one generation a year, the eggs, laid probably on the stalks or the keys, hatching in the beginning of August, the larvae feeding on the keys until autumn, when they hibernate somewhere until the middle of May of the following year, when they again curl the leaves.

This procedure is described and a detailed description is given of the larva, the pupa and the mode of pupation, with numerous figures.

TRÄGÅRDH (I). **Krusbärskvalstret** (*Bryobia praetiosa*, K.)—*Meddelanden från Centralanstaltens Entomologiska Avdelning, Uppsala*, no. 17, 1914.

A review of the literature regarding this mite leads the author to the following conclusions:—All the different species described by Koch, G. Canestrini and F. Fanzago, Berlese, Tjomas and Garman, under the names of *praetiosa*, *speciosa*, *nobilis*, *gloriosa*, *ribis* and *pratensis* must be referred to *praetiosa*, K., being mere variations and different instars of that species.

The differences as regards the shape of the cephalothoracic plate and the hairs on the front femora, on which Berlese bases his two species, are not specific, but only variations, as proved by Oudemans and the author. The arguments which Thomas and v. Hanstein bring forward to show that *ribis* is different from *praetiosa*, namely, that Koch mentions only 4 dorsal hairs on the latter, are not valid, because Koch in his diagnosis of *nobilis* distinctly states that the latter has the same three pairs of hairs as *praetiosa*. Von Hanstein's argument that *ribis* is different from *praetiosa* as described by Canestrini, because the latter author has found larvae and nymphae of *praetiosa* as late as July, whereas the propagation in Germany takes place in April and May, is not valid, as Marlatt has shown that in the United States the breeding period is greatly influenced by latitude and climatic conditions.

*B. praetiosa* is spread all over Europe, southwards as far as Egypt, northwards to the Arctic regions, and occurs in the United States. In Europe it is well known as occurring in moss, under stones, etc. but lately it has begun to attack gooseberries and has become a serious pest of them. In the United States, on the contrary, it is only recorded from several kinds of fruit trees and clover, but not from moss.

The cephalothoracic plate does not exist in the larva, which gives it a likeness to the larva of *Tetranychus*, from which, however, it is easily separated by the different shape of the hairs of the body, those of *Bryobia* being flat and scale-like; in the first nympha (length 0·34 mm.) the plate is indicated by the lateral pair of the 4 anterior hairs being inserted on small prominences; in the second nympha (length 0·45–0·47 mm.) the plate is better developed, although still much smaller than in the adult. It is, in consequence, easy to distinguish between the different instars with the aid of the shape of the cephalothoracic plate. The hairs of the body are present in the same number and position in all instars—4 pairs on the cephalothorax, 2 of in which in the second nympha and in the adult are inserted on the plate and 12 pairs on the abdomen; the hairs of the adult are broader than those of the larva and of the nymphae. Two pairs of eyes exist, contrary to Berlese's and Sorauer's statements; the tarsi are provided with two claws and between these an empodium provided with two dense rows of adhesive hairs; in the adult, however, the first tarsus has much weaker claws and greatly reduced empodium owing to the first pair of legs having developed into tactile organs.

The propagation of the gooseberry mite takes the same course in Sweden as it does in England and Germany; the eggs hibernate on the branches and in the beginning of May the larvae make their appearance, the greatest amount of damage being done in May and the begin-

ning of June ; in the last weeks of June the eggs are laid and the adults disappear.

The damage consists in the mites sucking the sap of the leaves, which results in the appearance of white patches, which become so numerous that often the whole leaf turns white and finally falls off, as do also the berries.

As a remedy, the author suggests the use of lime-sulphur spray against the eggs in early spring.

KURDJUMOV (N. V.). **Главнѣйшія насѣкомыя, вредящія зерновымъ злакамъ въ средней и южной Россіи.** [The more important insects injurious to grain-crops in Middle and South Russia.]—**Труды Полтавской С.-Х. Опытной Станціи. Отдѣлъ сельско-хозяйственной энтомологіи.** [*Studies from the Poltava Agricultural Experiment Station*, No. 17. *Department of Agricultural Entomology*, No. VI.] *Poltava*, 1913, 119 pp., 49 figs., 7 col. plates.

In a short preface to his book the author points out that the absence in the Russian literature of a work devoted to insect pests of grain crops led him to undertake this task. The book deals only with insects injurious to standing crops, the pests of grain in warehouses and stores not being included.

The first chapter of the book consists of synoptical tables of identification of various insects according to the stage of the pests and the parts of plants injured by them ; the tables contain (1) insects and their stages injurious to sown grains and roots of grain ; (2) those injurious to sprouts of young plants ; (3) those injurious to leaves and stems of plants in a more advanced stage of growth ; and (4) insects and their stages injurious to grain in the ear. The author goes on to deal separately with various orders of insects, starting with Orthoptera, and describes the habits of the following ACRIDIIDAE :—*Locusta* (*Pachytylus*) *migratorius*, L., *L. danica*, L., *Caliptamus italicus*, L., *Oedaleus nigrofasciatus*, de G., and *Stauronotus moroccanus*, Thunb. He then passes to the remedies against them ; ploughing in autumn to destroy the egg-masses, insecticides (which he considers to be the most important remedy against the larvae), poisoned food, hopper-dozers, crushing, burning, and driving into trenches. He further deals in the same way with *Gryllotalpa gryllotalpa*, L., and devotes the third chapter of his book to various species of Thrips. *Limothrips denticornis*, Hal. (*Thrips secalina*, Lind.), a description of which is given, occurs on rye ; it winters in the imago stage on wild grasses, but only the female survives, the male perishing during the summer. The injury done by the larva and imago is described, but the author is unable to suggest any remedies, as the reploughing or burning of the stubble would prove of no use, owing to the absence of the insects from the latter in autumn and winter. *Stenothrips graminum*, Uzel, is usually found in oat fields ; the author suggests as a preventive not to sow early oats, these being also less productive. This species winters as a larva deep in the earth ; therefore ploughing in the stubble would not be effective. *Haplothrips aculeata*, F. (*Thrips frumentarius*, Beling), is often mistaken for *H. tritici*, Kurdjumov ; the insect winters in the imago stage and attacks rye-crops early in

the spring ; only the females hibernate. Early in July the first generation migrates to maize, on which a second generation is produced. *Haplothrips tritici*, Kurdj., is the most important and injurious species in these parts of Russia. It winters in the larval stage in the earth or on wheat stubbles, and these larvae do not become mature until about a month after their appearance in the first half of May. The imago flies first on to rye, passing afterwards on to wheat, both winter- and summer-sown, where oviposition takes place. The injuries caused by this pest are very serious, owing to its great numbers ; in 1912 it was impossible to find grains of wheat which had not either been injured by the insects or did not contain a larva. As remedies, the burning of the stubbles is recommended, from which good results are expected, judging by the experiments conducted at the Poltava Experimental Station in 1911 ; the reploughing or scarifying of the stubbles in July is also effective, as after these operations the moisture of the soil is greater, thus favouring the development of the fungus, *Botritis bassiana*, Bals., which attacks these pests.

The author further describes the life-history, the injury done by, and the control measures against the following bugs:—*Eurygaster integriceps*, Osh., *E. maura*, L., and *E. austriaca*, Schr., *Aelia acuminata*, L., and two species of *Miraria*. He goes on to describe various Aphids injurious to grain crops, giving a synoptical table for their identification. The following species are dealt with:—*Macrosiphum granarium*, Kirby (*Siphonophora cerealis*, Kalt.), *Toxoptera graminum*, Rond., *Brachycolus noxius*, Mordw. (*korotnevi*, auct.), *Sipha maydis*, Pass., *Aphis padi*, F., *A. avenae*, F., *A. euonymi*, F., *Anoecia corni*, F., *Tetraneura ulmi*, de G., *T. rubra*, Licht., *Pentaphis trivialis*, Pass., *P. marginata*, Koch, *P. setariae*, Pass., and *Paracleutus cimiciformis*, Heyd.

In dealing with Lepidoptera the author devotes most of his attention to *Euxoa* (*Agrotis*) *segetum*, Schiff., and next to *Oria* (*Tapinostola*) *musculosa*, Hb. (*frumentalis*, Lind.) and *Trachea* (*Hadena*) *basilinea*, L. *Oria musculosa* is one of the chief pests of grain crops in North Caucasia, in the province of Don and in the Governments of Taurida, Cherson, and Ekaterinoslav. The insects are on the wing during June and July and oviposit on young shoots, also on weeds and stubbles, each female depositing up to about 200 eggs. The eggs remain over the winter, the caterpillars appearing at the end of April and boring into the stems, where they develop. The larvae pupate in the earth during the first half of July, the imago emerging in about a fortnight. The plants most injured by these insects are wheat, both summer-sown and winter-sown, barley and oats ; they do not touch maize. The remedies suggested are the burning of the stubbles, the mowing and burning of weeds round the fields, and the reploughing in autumn of the attacked fields to a depth of about 7–8 inches, also the rotation of crops, including the cultivation of such plants as maize, beet and potatoes, which are not injured by the pests. Besides these most injurious moths, the author deals also with *Feltia* (*Agrotis*) *exclamationis*, L., *Euxoa* (*Agrotis*) *tritici*, L., *Hydroecia nictitans*, L., *Phlyctaenodes sticticalis*, L., *Pyrausta* (*Botys*) *nubilalis*, Hb., *Crambus luteolus*, Schiff., *C. jucundellus*, H.S., and *Ochsenheimeria taurella*, Schiff.

The sixth chapter is devoted to Coleoptera, chief amongst which must be placed *Pentodon idiota*, Hbst., *Anisoplia austriaca*, Hbst., *Agriotes lineatus*, L., *Lema melanopa*, L., all of which are very fully discussed. An

account is also given of *Zabrus tenebriodes*, Goeze, *Ophonus* (*Pardileus*) *calceatus*, Duft., *Melolontha melolontha*, L., *M. hippocastani*, F., *Amphimalus solstitialis*, L., *Anisoplia cyathigera*, Scop., *A. segetum*, Hbst., *Tropinota hirtella*, L., *Athous niger*, L., (more common and injurious in the south of Russia than *Agriotes lineatus*), *Opatrum sabulosum*, L., *Pedinus femoralis*, L. (the last two species injure tobacco and maize), *Dorcadion carinatum*, Pall., *Lema cyanella*, L., *Chaetocnema aridula*, Gyll., and *Phyllotreta vittula*, Redt. The larvae of *Chaetocnema aridula*, Gyl., are found in the governments of Poltava, Charkov and Tula, and probably also in many others; they winter in the imago stage and appear in the fields early in spring, ovipositing on the dead parts of plants, close to the earth; the larvae live inside the stems of rye, wheat, barley and oats, but the greatest damage is done to summer wheat and to barley; the second brood appears in the middle of July. Dry weather favours the injurious activities of this pest; as a remedy early ploughing of the stubble is recommended.

The author then proceeds to describe the dipterous insect pests:—*Mayetolia destructor*, Say, to which special attention is paid; *M. avenae*, Marchal, which has not been previously recorded as a pest in Russia; *Lasioptera cerealis*, Lind.; *Contarinia tritici*, Kirby, which is seldom injurious in Russia; *Oscinella frit*, L., with which the author again deals very exhaustively. The last-named insect flies from the beginning of May, the average duration of life in nature being 2–3 months; the number of generations may be three or four during one summer, although the author is of opinion that in the latitude of Poltava there is only one generation. The insects may be found till the middle of October, the greatest damage being done to summer-sown crops, the winter crops being able to recover from their injuries during the long autumn. As to remedies, the author approves of the late sowing of winter crops, deep early ploughing, early scarifying of the stubbles, and strongly recommends the destruction of fallen crops; he points out that every prolongation of the period of growth of summer-sown crops increases the percentage of their infection by this insect, and that those sorts of summer crops which tiller less and come into ear earlier are better able to withstand the attacks of the pests; while winter crops recover by their tillering early in spring and late in autumn, summer crops by the same tillering increase their chances of infection. Other flies mentioned are *Chloropus taeniopus*, Mg., which produces two generations yearly, and sometimes does considerable damage to crops, especially if winter-sown; *Meromyza saltatrix*, L., which is not very injurious; *Hylemyia* (*Leptohylemyia*) *coarctata*, Fall., the damage done by which is specially noticeable in spring on winter wheat and rye; *Hydrellia griseola*, Fall., reported from Crimea, and from so far North as the governments of Moscow and Kurland, injures chiefly late-sown barley; and *Domomyza nigripes*, Zett., which injures mostly leaves of winter wheat, although the damage is not great.

The last chapter of the book contains the descriptions of some Hymenoptera, the most important of which are the sawflies, *Cephus pygmeus*, L., *Astatus niger*, Harr. (*troglodytes*, F.), found in middle Russia on rye, and *Trachelus tabidus*, F., from south Russia. The author describes the habits of and remedies for *C. pygmeus*, and is of opinion that the method of harrowing out and burning of the stubble,

after the land has been scarified, is ineffective; he gives a table summarising the results of some experiments conducted at the Station in Poltava in 1912, from which it appears that after the harrowing has been thrice repeated only 5½ per cent. of the stubble has been thrown out. As to the burning, the author is of opinion that this remedy can be applied on winter-sown fields, especially when this is done early in July and in dry years. He does not think that an earlier harvest can be considered a remedy, as the insects usually leave the crops much before they can be harvested. The deep ploughing of the stubble seems to be the best remedy, as is shown by some experiments at the Station, which, however, are not quite completed. *Isosoma noxiale*, Portch., in some years attacks up to 80 per cent. of the stems, although the actual damage is less than it appears, as it has been shown by some experiments at the Poltava Station that the loss to the weight of grain in the attacked stem is 10 per cent. and less. This species has only one generation, the larvae remaining over the winter inside the stems, so that the greater part of them is taken home after the harvest; the thrashing of the crops does not usually destroy the insects, unless a straw-press is used, and the author recommends using the straw of winter wheat as fuel or as litter during the winter months; where long stubble is left in the fields it should be burned off. *Isosoma tritici*, Fitch (*Isosoma hordei*, Harr.), is very injurious in the governments of Cherson and Ekaterinoslav.

The descriptions of most of the pests given in the book are accompanied by figures of their various stages, plants injured by them, etc. A supplement deals with the Tarsonemid mite, *Pediculopsis graminum*, E. Reuter. The work constitutes a most useful book of reference on the subject.

De Castro Sobrinho (A. R.). **A Batata Inglêsa e a sua Cultura.** [The English Potato and its Cultivation.]—*Boletim do Minis. da Agric. Indust. e Comm., Serviço de Informações e Divulgação, Rio de Janeiro*, 1913, i, no. 5 (Nov.-Dec. 1912), 1913, pp. 74-83. [Received 16th Jan. 1914.]

In this pamphlet, which deals with the general cultivation of the potato in Brazil, the author says that the following insect pests of the plant are known:—The potato beetle (*Leptinotarsa decemlineata*), which can be kept down by copper sulphate sprays; a hawk-moth (*Acherontia atropos*), the larva of which is one of the worst enemies of the potato and other Solanaceae; "*Noctua solani*, Fab.," the larva of which is known as "*bicho pardo*" and devours the lower parts of the plant; and an aphis, which may be destroyed by dusting with lime or plaster of Paris.

Bondar (G.). **Brocas das Laranjeiras e outras Auranciaceas.** [Borers of orange trees and other Aurantiaceæ.]—*Boletim do Minist. da Agric. Indust. e Comm., Serviço de Informações e Divulgação, Rio de Janeiro*, ii, no. 3, May-July 1913, pp. 81-93, 15 figs.

The author says that the most important citrus borers in Brazil are *Acrocinus accentifer*, *Diploschema rotundicolle* and *Cratosomus reidi*. In addition to these, C. Moreira has met with a Cerambycid, *Rhopalophora collaris*, Germ., and H. von Ihering records *Trachyderes*

*succinctus*, though these are by no means common. The large Longicorn beetle, *Acrocinus accentifer*, Oliv., is generally distributed in Brazil and the damage done by it is very serious. In three or four years it is capable of completely destroying a citrus plantation ; the destruction of the tree is certain, unless immediate preventive measures are taken. The insects lay their eggs in spring and summer, by preference at the base of the trunk, boring holes for the purpose with their mandibles. The larval stage lasts for about a year, and pupation takes place between July and September, the beetles emerging from August to October, and sometimes later. The beetle flies but little, and does not propagate rapidly, and the author thinks that this is the explanation of the fact that sound and bored trees are constantly found close together. The insect is common in the bush and does similar damage to the white cedar (*Cedrela brasiliensis*) and to certain other trees of different families. The best time for killing the borer is in the months of May and June. The lower parts of the trunks of the trees should be carefully examined and the burrows should be opened up ; a little bisulphide of carbon is then injected into the hole with a syringe, and the hole immediately stopped with a plug. This process will kill the lava, pupa or perfect insect. Benzine or gasoline will also answer the purpose.

*Diploschema rotundicolle*, Serv., another Longicorn, attacks orange, mexeriqueiras (*Citrus deliciosa*, R.), and lemon trees. The damage is somewhat different from that done by the previous insect. The eggs are laid from December till April in minute incisions at the extremities of the branches. The larva bores downwards through the larger branches to the trunk, and the burrows never communicate with one another. Sometimes the trunk is riddled through its whole thickness, and the author says he has seen the trunk of a lemon tree which contained 16 such burrows. The length of the burrow may be as much as 7 to 10 feet. The active condition of the larva lasts approximately 8 months. When growth is completed the larva turns and mounts upwards, enlarging a portion of the burrow into a chamber and making an elliptical orifice $\frac{1}{2}$ inch in diameter for the exit of the perfect insect. This orifice can be easily distinguished from the exit holes for frass made during growth, as it is of larger diameter. Below this opening the larva blocks the burrow, forming a chamber 3 to 5 inches in length, in which it is protected from the attack of ants, etc., in the last period of its development. This chamber is made in the spring at the beginning of the second year of larval life. The pupal stage, according to A. Sampaio, occupies 71 days. The author goes into considerable detail as to the manner in which the burrows are formed and their varieties, and gives a number of figures and photographs. Occasionally the larva makes horizontal burrows, which the author explains as a provision against its being crushed by the natural growth of the stem and by the cicatrisation of the wounds made. He says that this insect damages peach trees in a similar manner, and that in the bush it is frequently to be found on a Euphorbiaceous tree (*Croton foribundus*) locally known as "tapichingui." The treatment consists in inspecting the trees in the months of May and June, searching for frass, and, as the larva has not yet descended into the trunk, cutting off the ends of the small branches. It is then easy to destroy any larva which may have descended towards the trunk

or into an important branch. All the lateral holes for the extrusion of frass should be plugged with wax or clay, and then bisulphide of carbon injected, as in the previous case, into the terminal opening of the burrow. A. Sampaio, after careful study of trees throughout the year, but especially from November to May, says that the female lays her eggs on new and tender branches in the axils of the leaves. Hatching takes place in from a few days to a few weeks, and it will be seen that the buds and young leaves begin to wither; this, he says, is sufficient proof of the presence of the pest, and if this fading of the leaves and buds be carefully watched for, the damage can be stopped almost immediately by cutting off the tip of the branch or twig.

*Cratosomus reidi*, Kirby, is a large weevil, the larva of which causes very serious damage to orange trees and mexeriqueiras (*Citrus deliciosa*, R.). In several orchards in Campinas this beetle is very abundant, and it is quite a common thing to find from 3 to 10 individuals at work on one tree. The author says that so far no mention has been made of this insect in the agricultural literature of Brazil, in spite of its being so widespread and destructive. He gives the following particulars as to its bionomics. The eggs are laid separately in the spring, in ones and twos, in small holes made in the bark of the tree. The trunks are attacked from the base as far as the branches, and holes have also been found on roots projecting above the soil. As soon as hatched the larva begins to bore into the wood, for some time in a horizontal direction. The frass has the appearance of little balls about 1·5 mm. in diameter, consisting largely of the excrement of the larva. During the first period of development, which lasts for about a year, it is not difficult to discover the borer by means of this characteristic frass upon the ground. In the second year the frass blocks up the hole as if with ribbons of wood, giving characteristic evidence of the presence of the borer, of which there is no other external indication. Sometimes the burrow is superficial, following the bark, and sometimes it is at a depth of 1 to 4 inches. The author has found trunks bored through their whole thickness, and there is a specimen in the Instituto Agronomico containing seven parallel bore-holes made by different insects. In the case of mexeriqueiras, it frequently happens that the trunks or branches are bored to such an extent that they are broken off by the wind. Old bore-holes, from which the frass has been removed by ants, may be confounded at first sight with those made by *Diploschema rotundicolle*, but a slight examination will show the difference. The holes made by *Diploschema* are straight and of uniform diameter, and the walls are marked by transverse incisions made by the mandibles. The bore-holes of *Cratosomus* are generally much larger, sinuous, of variable diameter, and the walls are smooth.

The development of the insect requires two years. Pupation takes place during August and September; the perfect insect is produced in September or October, and emerges in October, November or December. The exit opening attracts attention by its extraordinary size. It is not at all uncommon to find holes of 15 to 17 mm. in diameter in the trunks of orange trees. These holes are found at various heights above the ground, but generally from 50 cm. to 1 metre up the trunk. For a long time it was supposed that these holes were made by *Diploschema*, but careful study showed that this was not the case, and it is now possible to distinguish the attack of the two

insects. The exit hole of *Cratosomus* is round and the bore is inclined upwards, whilst that of *Diploschema* is elliptical, 13–14 mm. across and 9–10 mm. vertically. A new hole indicates that the larva has formed its chamber for the pupal stage, which lasts about a year. The total length of the burrow of *Cratosomus* is 60–70 cm., the diameter being 12–20 mm. It is easy to understand that damage of this kind has a very serious effect upon the trees ; one borer alone may endanger the life of a tree. The author describes the larva, nymph and perfect insect, and says that the species is peculiar to Brazil. Nothing is at present known of the indigenous plants on which it feeds.

The remedy, the author says, is simple during the first year of boring, when the frass on the earth reveals the presence of the pest. The opening is slightly enlarged with a boring tool, so as to admit the nozz'e of a syringe, and 2 or 3 cc. of bisulphide of carbon are injected, the hole being immediately plugged with wax or clay ; the best time to do this is either in May or October. Borers in their second year should be treated in September, when the exit hole has not been opened externally. It is possible, by carefully examining the trunks, to find the position of these holes, the bark over them being dry and split and frequently covered with a gummy moisture. All that is necessary is to remove the bark on this spot and introduce a piece of wood of suitable size and drive it tightly into the hole. The perfect insect then remains imprisoned and dies. The best prophylactic in orchards in which this borer makes its appearance is that used against *Acrocinus accentifer*, that is, to smear the trunks with a substance which drives away the insects and prevents them from laying their eggs. The author gives the following formula :—Crude carbolineum, 1 part ; quicklime, 10 parts ; water, 40 parts. The lime is first dissolved in a little water, the rest is then added and then the carbolineum is well stirred in. The insect does not fly with ease, and once destroyed, the author thinks that very little trouble will be required to preserve an orchard against further attack. The paper is exceedingly well illustrated with diagrams and photographs showing the method of attack peculiar to each of these borers.

Ihering (R. Von). **Em defeza do "Tico-Tico."** [In defence of the "Tico-Tico" (*Brachyspiza capensis*).]—*Chacaras e Quintaes, S. Paulo*, viii, no. 4, Oct. 1913, pp. 47-49, 1 fig.

The author says that this bird, formerly known as *Zonotrichia pileata*, should be protected in Brazil. From experiments made by himself and still in progress, he has found that each bird consumes daily, on an average, 120 insects, either as adults or larvae. He further calculates that in his own garden of about 7 acres, in which a colony of 40 Tico-Ticos have established themselves, these birds eat close upon 5,000 insects and larvae daily.

Poskin (J.) **Rapport sur les observations effectuées en 1912.** [Report on the observations made in 1912.]—*Ann. Sta. Agronom. de l'Etat, Gembloux, Bruxelles*, ii, 1913, pp. 353-366.

Among cereals, *Tylenchus devastator, Oscinis frit* and *Zabrus gibbus* have been reported, but they occur only in isolated areas and do not cause serious damage. Sugar-beet has been severely attacked by

*Aphis papaveris* in certain localities. *Cassida nebulosa* and *C. oblonga*, pests of the beet, well-known but fortunately rare in Belgium, are capable of causing considerable havoc; arsenical spraying appeared to be effectual against them.

Among Aphids, *Hyalopterus pruni*, *Myzus ribis* and *M. cerasi* have severely attacked various fruit trees. *Aphis mali* was abnormally abundant, causing much damage to apple trees. *Eriosoma* (*Schizoneura*) *lanigerum* also continues to spread. The pest limits itself to the more superficial roots, and on this account winter treatment is preferable. The destruction of the infected roots or the sulphuring of the soil around the trees is far more effective than washing the trunk and branches with soapy water. The British Board of Agriculture recommends strongly the use of calcium carbide, which in the presence of water gives off acetylene. Pieces of the carbide are introduced into holes in the earth around the tree, which should then be closed immediately. If the earth is very damp, in order to prevent too rapid decomposition, the pieces of carbide can be folded in paper. The difficulty of summer treatment is in finding a suitable method of applying the insecticides. M. Ritzema-Bos is of the opinion that no really efficacious method of dealing with this insect exists; after each treatment a few survive and these rapidly increase.

Observations have also been made on forest trees. It has been specially noted that much damage has been wrought among the oaks in Belgium, and it will probably become a question as to whether they should not be excluded from the forests. The pest attacking the oak in the region of Valenciennes is a Buprestid beetle, *Agrilus biguttatus*, F. In the forest of Raismes there was great mortality among the trees. In 1881 Altum noted that this Buprestid was rather common in the district of Eberswalde; it is also mentioned by Judeich and Nitsche and by Nüsslin. Checking the pest is unfortunately difficult, except by destruction of the infested trees. *Agrilus viridis*, so far as is known, is limited to the forest of Raismes.

Pospielov (V.) **Свекловичный долгоносикъ и мѣры борьбы съ нимъ.** [*Bothynoderes punctiventris*, Germ., and methods of fighting it.]—An Agricultural Monograph published by **Главное Управленіе Землеустройства и Земледѣлія, Департаментъ Земледѣлія.** [Central Board of Land Administration and Agriculture, Department of Agriculture.] *St. Petersburg*, 1913, 2nd Edition, 116 pp., 8 figs, 3 tables.

*Bothynoderes punctiventris*, Germ., is one of the most permanent and serious pests of sugar-beet, and is found from Austria-Hungary to Caucasia and the southern part of Siberia (Dauria). Within these areas it is to be found wherever beet is grown, but in some places its development is checked by certain meteorological local conditions, as, for example, in the governments of Kursk, Tambov, Samara and Voronezh, and in Russian Poland; but in the governments of Kiev, Podolia, Charkov and some other parts of south-western Russia its power of multiplication is very considerable. It was in the district of Tchigirin, in the government of Kiev, "the cradle of the Russian sugar-beet industry," that its injurious activity was first noticed in 1851; in the middle of the 'eighties of last century it was first observed

in Hungary, thence spreading to Austria, Moravia and south-eastern Germany. The author gives a list of 25 species of CURCULIONIDAE which he has observed from 1903 to 1905 in beet plantations in Kiev, of which 14 species are recorded for the first time from beet (pp. 12–14). He has not found *Leucosomus pedestris*, Poda (*ophthalmicus*, Rossi) or *Psalidium maxillosum*, F., though these have been reported by other authors; he also gives some information as to the habits of some of these pests.

*B. punctiventris* winters in the imago stage, the beetles remaining beneath the earth after their emergence from the pupa in the autumn Only a very small percentage (1–4 per cent.) winter in the pupal stage, and a considerable proportion of these perish during the winter. In spring the insects appear, and the resulting larvae pupate in July, so that there is normally only one generation in the year.

Outside beet-plantations there is very little food for these insects, as their wild food-plants are only *Atriplex* and *Chenopodium*; they do not touch, even when starving in captivity, either *Artemisia*, *Plantago*, vetches, or any other papilionaceous plant; the damage done by them to beet is therefore the more serious, once they get on to a plantation, especially if they arrive there at the moment when the sprouts just appear. In that case they attack the cotyledons and bite through the shoots. When the second pair of leaves appears, the sprouts are better able to withstand the attacks of the insects, which then eat round the leaves, but are not able to gnaw through the whole plant.

The female is able to lay 1–6 eggs daily; the total number of eggs laid by 3 females in captivity was 82, 84 and 110 respectively. The insects apparently prefer friable surfaces for oviposition. As to the duration of the life of the insects, specimens are often found which live three months and more, the male usually living the longer; one male was kept alive for 6 months.

The author further describes very fully the egg, the larva, its moulting stages, the process of moulting, the pronympha and the pupa of *B. punctiventris*. According to his experiments the development of the larva inside the egg lasts 10–11 days, the larval stage occupies somewhat less than two months (48, 49, 51 days) the pronymphal stage about 5 days, and the pupal stage about 13–16 days. The larvae feed on the roots and the direct damage done by them does not appear to be very great, causing the death of the plants only when accompanied by drought; but the effect upon the sugar production is considerable.

The author goes on to deal with the conditions favouring and checking the development of *B. punctiventris*. The weather conditions influence the oviposition and consequently also the number of eggs laid; the development of the larvae also depends on the meteorological conditions, as they require a moderate amount of moisture in the soil; abundant moisture provokes various fungus diseases, while drought causes the larvae to pass deeper into the earth, where they find no food, and dwarfed pupae are produced. Extensive drought also provokes red muscardine (*Sorosporella uvella*, Krass.). The weather conditions influence also the hibernation of the imago, a rainy autumn and a winter with little snow and frequent thaws causing the death of many beetles.

As to the insect enemies of *B. punctiventris*, no parasites are known to exist. The following are amongst the enemies of this insect from the animal world :—(1) ants ; (2) various beetles of the family CARABIDAE : *Poecilus cupreus*, L., *P. punctatus*, Schall., *Pterostichus melas*, Creutz, *Amara apricaria*, Payk., *Ophonus pubescens*, Müll., *O. griseus*, Pz., *O. calceatus*, Duft., and *Harpalus psittaceus*, Fourc., all of which, both in their adult and larval stages, destroy the larvae and pupae of *B. punctiventris* ; (3) another beetle, *Hister fimetarius*, Hbst. ; (4) birds, such as rooks (*Corvus frugilegus*) and some species of bustards. In the stomach of a rook, examined by Terestchenko on the evening of 20th April 1905 (the first warm day when the beetles started leaving their holes), there were found 133 proboscides of *B. punctiventris*, 1 undamaged specimen of *Poecilus cupreus*, 2 specimens of *Hister* sp., and 13 wheat grains ; (5) some parasitic worms of the genus *Mermis* and microscopic ASCARIDAE.

The activity of all these animal enemies of *B. punctiventris* is, however, insufficient to check its multiplication. A more important part is played in the destruction of this pest by various parasitic fungi, which provoke the muscardine disease amongst the larvae, pupae and imagines, from 20 to 80 per cent. perishing from this disease in different years, it being more prevalent in the years in which the weevils are most numerous. The author deals very fully with the various forms of this disease and with the many experiments which have been undertaken in order to infect the pests with it. He describes the "green muscardine," so called by Metchnikov, produced by the fungi *Oospora destructor*, Metchn., *Entomophthora anisopliae*, Metchn., and *Isaria destructor*, Metchn., and the "red muscardine" produced by *Sorosporella uvella* ; both these diseases attack all the stages of the beetle, except the egg. There is also a "white muscardine" provoked by the fungus *Botrytis bassiana*, which, according to Krassiltchik, attacks the imago of *B. punctiventris*, while he was not able to detect it on the larvae or pupae of this insect. Attempts were made at Smiela, by Krassiltchik in 1884 and by Danysz in 1900, to disseminate these diseases artificially, but without success. Toporkov, in discussing these experiments, has suggested that only green muscardine should be used, as the white form does not develop well in the soil of the government of Kiev ; and he further recommended that the infection should be induced by sowing the spores of muscardine in the earth together with the seeds of beetroots, for which purpose the seeds must be covered with a powder of the spores, about 10 lb. of the latter being used for approximately $1\frac{1}{4}$ cwt. of seeds. However, the experiments undertaken by Toporkov failed, as did also some other experiments at the Station in Smiela. The author urges the necessity of further investigations, in such a direction as to show which micro-organisms and which of their stages are active destroyers of the larvae of *B. punctiventris* ; what are the natural conditions favouring the spread of the disease ; how long the micro-organisms retain their activity ; and how deep they must be buried in the earth. With regard to the first of these questions the author refers to the work of P. Buchner on Symbions ("Studien an intracellularen Symbionten," Arch. f. Protistenkunde, xxvi, 1912) and suggests that probably *Oospora destructor* is a symbion, producing mycelium only in larvae living in unfavourable conditions. The author has also found some diseased

larvae from which he obtained examples of *Bacillus bombycis*, the number of larvae suffering from this disease (flacherie) being considerable in the wet summer of 1903.

Coming to the remedies the author divides them into two groups—mechanical remedies, more or less connected with the methods of soil cultivation, and chemical remedies. In order to destroy the eggs which have been laid in the spaces between the rows, and also the larvae, he suggests hoeing the surface so as to make the soil friable, and gives a table showing the satisfactory results of this method. In order to destroy the wintering specimens autumn ploughing of the fields to a depth of 8–10 inches is recommended, thus exposing the beetles to the weather. The author is also of opinion that the fields ought to be left fallow instead of using them, as is now done, for summer crops; he further recommends the use of mineral manure, and a reduction in the size of the plots so that they can be better protected by surrounding trenches. These trap trenches usually have a width and depth of 14 inches, with smooth walls, that next to the plot having an inclination of 30°; along the bottom of the trench holes about 8–9 inches deep are made at intervals. The beetles that are trapped must be collected daily and destroyed by burning or with boiling water. In order to facilitate the detention of the beetles the use of various sticky substances is recommended; these should be smeared over straw, which is put into the holes in the trenches, and sticky strings may be placed along the channels. The best material is Tree Tanglefoot, but the author gives also a recipe for an adhesive, which he recommended in 1904. About 7 lb. of crude naphtha is heated to the boiling point, after which about 8 lb. of resin is gradually added. This adhesive is most effective at a temperature of 20° R. (77° F.); in the sun at a higher temperature it melts, so that the proportion must be altered to one of 8 lb. of resin to 6 lb. of crude naphtha. This mixture can also be smeared over small boards, which are put into the trench. The use of small tin vessels sunk in the floor of the trench is also recommended, as they require less attention, and when full can be easily emptied and replaced. All these practical matters are dealt with in detail by the author and are accompanied and illustrated by various tables and figures.

An account is then given of sprayers of different kinds which can be used either on special trap zones or over the whole plantation. These zones are useful so long as the insects move on foot, but must be abundantly sprayed with strong insecticides; later on it is necessary to spray the whole of the plantation. Barium chloride and Schweinfurt green are considered to be the best insecticides. The former is more effective during hot weather, which the author attributes to the influence of the sun's rays on the beetles. He describes some of his experiments, which have shown that when exposed to the rays of the sun the beetles perish, even when they have not been previously poisoned. The effect of barium chloride is to produce paralysis of the legs, which prevents the beetles from taking shelter from the sun underneath leaves, where they normally hide during the hot hours. In wet weather the effect of this insecticide is not so great and sometimes it is quite useless. "Djipsin" and Scheele's green are not so effective as the two first-named insecticides, which may also be combined.

GRANDI (G.). **Gli stati postembrionali di un Coleottero** (*Otiorrhynchus cribricollis*, **Gyl.) a riproduzione partenogenetica ciclica irregolare.** [The postembryonal stages of a beetle (*O. cribricollis*, Gyl.) with parthenogenetic reproduction at irregular intervals.]—*Boll. Lab. Zool. gen. agrar., Portici*, vii, 24th Sept. 1913, pp. 72-90, 12 figs.

Of the weevils of the genus *Otiorrhynchus*, Germ., three species are already known to reproduce parthenogenetically at irregular intervals; *O. turca*, Boh., *O. ligustici*, L., and *O. cribricollis*, Gyl. The author gives a full description of the last-named species in all stages. The eggs are laid at night in the second half of September and early in October. The females seem to prefer dewy nights, when they climb up the stems of the lucerne, on which they feed, and drop their eggs on to the ground. In the laboratory the eggs hatched out in 14 to 24 days, and the larvae almost immediately disappeared into the soil. The adults begin to die in October and none are to be found by November. The author could not ascertain if any hibernate. The larvae have considerably increased in size by the end of November, and are then at a depth of 4 to 6 inches, feeding on the tender rootlets of the lucerne. The larval stage lasts about 6 months, till the following May; the pupal stage lasts from 10 to 15 days and the imago appears about the middle of June. It is then often the prey of an Ascarid, which is at present being studied. During July, August, and September the immature adults remain hidden by day a couple of inches beneath the surface, whence they issue at night to feed. Although the damage done by larvae and adults to the lucerne plantations at Portici are by no means negligible, yet it is not such as to cause alarm.

GRANDI (G.). **Descrizione della larva e della pupa della** *Sitona humeralis*, **Steph., ed osservazioni sulla morphologia dell'adulto della medesima specie.** [Description of the larva and pupa of *Sitones humeralis*, Steph., and remarks on the morphology of the adult of the same species.]—*Bull. Lab. Zool. gen. agrar., Portici*, vii, 6th Oct. 1913, pp. 93-100, 7 figs.

The larva of *Sitones humeralis*, Steph., feeds on the roots of various species of lucerne: *M. sativa*, L., *M. lupulina*, L., *M. minima*, Gruf. In view of the slight differences existing between the larva of *S. humeralis* and, for instance, that of *Otiorrhynchus cribricollis*, Gyl., the author believes that the distinctive characteristics of the larval stage of the various species of *Sitones* will not be markedly different. A very fully detailed description is given of *S. humeralis*, the full-grown larvae of which were found at Portici early in May. About the middle of the same month nearly all had transformed into pupae. The pupal stage lasts from 10 to 14 days. In captivity the imago appeared in the first week of June.

PALMER (E. F.). **Box-Packing of Apples.**—*Ontario Dept. Agric. Toronto, Ont., Bull.* no. 216, Oct. 1913, 24 pp., 13 figs.

This bulletin gives a detailed account of the best methods of packing apples in boxes. Regarding the wiping of apples there has been some discussion. The advent of the codling moth has made spraying imperative and it is this spray that is objectionable. An apple after being

wiped presents a better appearance to the average buyer. Wiping is easily done immediately after the fruit is picked. The apple should not be rubbed hard, the object being simply to remove the dust and spray, of which many people are afraid because of its poisonous nature, though it has been proved that it would take the spray from 600 apples to make a minimum dose of poison dangerous to a human being. A pair of cheap cotton gloves is superior to a rag for wiping.

Reutlinger (—). **Eine erfolgreiche Bekämpfung des Heu- und Sauerwurms.** [A successful method of combating the vine-moth.] —*Weinbau der, Rheinpfalz, Neustadt a. Hdt.*, i, no. 24, 15th Dec. 1913, pp. 308-311.

In an isolated vineyard of about 6 acres the author has succeeded in stamping out the vine-moth. The measures against the pupae were applied in 1910, 1911 and 1912. The grubs were combated in 1911, and also in 1912, though not so extensively. As a result only 11 moths were observed in 1913, and *Peronospora* and *Oidium* being also absent, perfectly healthy grapes were obtained. Nevertheless the methods employed against the pupae—brushing the stocks, earthing them up, and careful burning of all débris—were carried out in 1913, and the author lays very great stress on their conscientious execution. In dealing with the grubs the following formula was used: (*a*) 2 gals. water, 1 lb. soft soap, 1 lb. fusel oil, 1½ oz. raw nicotin (98 per cent.); or the alternative formula: (*b*) 2 gals. water, 1 lb. soft soap, 1 lb. methylated spirit, 1 lb. duty free tobacco-extract. The cost for these quantities was: soft soap 2½*d.*, fusel oil 1*s.* 6*d.*, raw nicotin (98 per cent.) 1*s.* 6d., methylated spirit 2¼*d.*, duty free tobacco extract 1*s.* 1*d.* The solution was squirted into suspicious places with sewing-machine oilers, with the nozzles of which any webs present were removed before injecting the insecticide. The work was performed by children, who are found to be by far the best suited for it. Walls, tree-trunks, etc., were searched and treated. Taking a working day of 8 hours, the wages of a man at 3*s.*, those of a girl at 1*s.*; the costs for labour during the 19th, 22nd, and 28th June 1911, worked out at 17*s.*, 17*s.*, and 16*s.* respectively. One man was employed on all 3 days, 14 girls on the first two, and 13 girls on the third; 20 gals. of emulsion (*a*) were used at a cost of 32*s.* The total expense for the 6 acres was £4 2*s.* (or £3 5*s.* if emulsion (*b*) is used). To this the cost of 20 oilers (5 kept as a reserve) must be added, 6*s.* In view of the poisonous nature of the insecticides, the workers were not allowed to take any food with them to the vineyard. The author states that wages have increased since 1911, and says that although he has practised bird protection for the past 20 years, the birds appear to do more harm than good.

Viereck (H. L.). **Type Species of the Genera of Ichneumon Flies.**—*U.S. Nat. Mus., Washington, D.C., Bull.* no. 83, 1914, 186 pp.

This bulletin consists of an alphabetic catalogue of the genera of the Ichneumonoidea together with the type of each genus, and references to descriptions of the genera. An index to the genotypes has been added.

Britton (W. E.). **Thirteenth Report of the State Entomologist.**—*Report of the Connecticut Expt. Stn. for* 1913, *New Haven*, 1914, pp. 181, 3 pls.

During the year 1913 there was an unusual abundance of the apple-tree tent-caterpillar, *Malacosoma* (*Clisiocampa*) *americana*, F., its presence being reported from very many towns. Specimens of the forest tent-caterpillar, *M. disstria* were received from Wallingford and Salisbury. The result of this abundance of tent-caterpillars led to the preparation of a new publication which appeared in August as Bulletin 177 [see this *Review*, ser. A, i, pp. 381–382], and gave a full account of the insects. Many cocoons were collected and nearly one-half of them were found to be parasitised by Ichneumons and Tachinid flies. A large proportion of the Ichneumons belonged to the genus *Pimpla*, *P. conquisitor*, Say, being one of the commonest species.

During 1912 white grubs were extremely abundant in Connecticut and similar damage was feared for 1913. Few complaints of white grub injury were, however, received; neither were the adult beetles so abundant as expected. The species were identified as *Lachnosterna fraterna*, Harr., and *L. fusca*, Froehl.

Serious damage to yews, *Taxus cuspidata* var. *brevifolia*, was reported from a nursery at Pomfret. From material forwarded to the laboratory the species was recognised as *Otiorrhynchus sulcatus*, F. This weevil devoured the small roots of the plants and attacked both the larger ones and the main stem below the surface of the ground. A similar injury to the roots of young hemlocks was recorded as caused by *O. ovatus*, L. Both *O. ovatus* and *sulcatus* are European species and the latter is recorded as injuring *Taxus* and Rhododendron plants in Europe. *O. sulcatus* has also been recorded as injuring grape vines, cyclamens and ferns, and as occasionally attacking garden vegetables. It is suggested that possibly carbon bisulphide injected into the ground around the plants in late summer might kill the larvae before they had seriously injured the plants. It has also been reported that in south-western Connecticut and in adjoining portions of New York State during the past two or three years many hickory trees have died and many more have been injured. The chief cause of this seems to be a small beetle, *Scolytus quadrispinosus*, Say. During July and August the beetles tunnel in the new growth at the axils of the compound leaves, causing them to break off. Later the parent beetles make their brood galleries just under the bark. When there are many galleries in the main trunk of a tree the effect is the same as girdling and the tree soon dies. Badly infested trees cannot recover and should be removed. Dr. Hopkins recommends that all infested trees be disposed of between 1st October and 1st May, so as to kill the over-wintering beetles. This can be done by peeling or by using the wood as fuel. If the outer portion be allowed to remain on the logs during the following summer the beetles will escape and may attack other trees. If a tree is not infested it may be worth while to spray the bark on the trunk and branches with lead arsenate, 1 lb. in 5 gals. of water. Thoroughly spraying the foliage with the same mixture after about 1st July may prevent damage to the leaf stems.

Infested fruit from Cannon Station, Mystic and Watertown contained the larvae of the pear midge, *Contarina* (*Diplosis*) *pirivora*,

Riley. This insect is distributed throughout the north-eastern United States and in Central Europe. The adult is a small two-winged fly which lays its eggs in the clusters at blossoming time or even earlier. Dr. Felt has found the larvae at the base of the calyx at the time the petals fall and they soon work their way into the young fruit. The infested pears usually crack open after rain and thus allow the maggots to escape. These maggots go into the ground to pupate and the adults emerge the following spring. Certain varieties as Bosc, Bartlett and Seckel seem to be injured more than others. The species has been gradually eradicated in New Jersey, but maintains itself in a few places near Newark and New Brunswick. No remedial treatment is known other than gathering and destroying the infested pears before the maggots leave them. The injured fruit may be distinguished by their deformed appearance. Cultivating the soil during the month of June would doubtless destroy many larvae in the ground.

In Greenwich, Conn., the West Indian Peach Scale, *Aulacaspis pentagona*, Targ., was discovered on Chinese privet, *Ligustrumibota*. It had not previously been recorded from Connecticut. It infests a great variety of plants belonging to widely different botanical families, and has a wide distribution. Dr. H. T. Fernald states that it has been found abundantly on flowering cherry imported into Massachusetts, and it is believed that this insect was present on weeping cherry imported from Japan three years ago into a Connecticut nursery. These trees were fumigated with hydrocyanic acid gas and when examined were clean. The low temperatures experienced during the winter in the States will probably prevent this scale from becoming a destructive pest. When not covered by the bark of the host plant the scales are white and conspicuous like therose scale, *A. rosae*, Bouché. If the scale withstands the winters and infests and injures trees and shrubs it is probable that a thorough spraying with a good contact insecticide, like the lime-sulphur wash or one of the oil mixtures, will serve to hold it in check.

BRITTON (W. E.). **Insect Notes.**—*Rept. Connecticut Agric. Expt. Sta. for* 1913, *New Haven*, 1914, pp. 250-256. 2 pls.

As a result of an examination of unhealthy and dying oak trees at Greenwich the trouble was found to be due probably, not primarily to insects, but to injury from cold and drought, followed by attacks of borers. The spruce bud moth (*Tortrix fumiferana*, Clem.) was very abundant in 1913 and swarms appeared suddenly on 31st July. The parsley stalk weevil (*Listronotus latiusculus*), not previously reported from Connecticut, was found at a farm in New Haven, and *Pulvinaria vitis*, L., which has seldom been injurious in Connecticut, has badly infested some silver maples at Sound Beach, Stamford. *Omphalocera dentosa*, Grote, has apparently been more abundant and done more damage in 1913 than in any preceding year since observations began. It is noted that the egg-clusters of the tussock moth (*Hemerocampa definita*, Pack.) are often mistaken for those of the gipsy moth, but the whole cluster is more loosely constructed and the eggs more exposed in the former. As a rule also the eggs of *Hemerocampa* are deposited on a network of silk, on or near the old cocoon. Gipsy moth eggs are

usually laid on a solid surface, except in the case of great abundance.

The San José scale, which for fifteen years has been a serious enemy of fruit trees, seems to be now on the wane, probably owing to the work of parasites and to spraying. The poplar sawfly, *Trichiocampus viminalis*, Fallén, has been common on Carolina poplars. There are two broods of larvae each year, the first appearing in June. These larvae feed upon the leaves and may be poisoned by spraying the tree with lead arsenate. The larvae of the Longicorn beetle, *Saperda vestita*, were rather common in young linden trees in one nursery this year. They tunnel under the bark and in the wood at the base. Where this borer causes damage, the only remedy is to examine the trees in May and September and to dig out the larvae or kill them in the burrows with a wire, or by injecting a few drops of carbon bisulphide and closing the opening.

*Lygus pratensis*, L., was unusually abundant in 1913, and injured many plants by sucking the sap from the bud or leaf stem. Several complaints were received regarding injury to dahlia buds, and in Litchfield, potatoes were damaged by this bug.

Britton (W. E.) & Walden (B. H.). **Inspection of Imported Nursery Stock and of Apiaries.**—*Rept. Connecticut Agric. Expt. Stn. for* 1913, *New Haven*, 1914, pp. 191-198.

A Federal quarantine and inspection law came into operation on 1st October 1912, which provided for a system of notices and permits covering all imported field-grown, woody stock entering the United States from other countries, and its enforcement is vested in a board designated as the Federal Horticulture Board. When the Federal law became operative the inspectors received notices as for all other stock and the consignee was requested to send notice to the inspector immediately on arrival of each shipment. Return post-cards were furnished. In some cases the consignee complied with the request, but in many instances the stock was unpacked and distributed without sending such notice, or the notice was sent and the inspector found that the stock had been unpacked and mixed with other stock. It became necessary therefore to obtain thorough and proper measures for inspection. The matter was placed before the legislature and Section 4388 of the General Statutes was amended as follows :—

" All nursery stock shipped into this State shall bear on each package a certificate that the contents of said package have been inspected by a State or Government Officer and that said contents appear free from all dangerous insects and diseases. If nursery stock is brought into this State without such a certificate, the express, freight, or other transportation company or person shall, before delivering shipment to consignee, notify the State Entomologist of the facts, giving name and address of consignee, origin of shipment, and approximate number of cars, boxes, or packages, and probable date of delivery to the consignee. The State Entomologist may cause the inspection and, if infested, the treatment of the stock. No person, firm, or corporation shall unpack any woody, field-grown nursery or florists' stock brought into this State from foreign countries, except in the presence of an inspector, unless given permission to do so by the said State Entomologist or one of his deputies. If such stock is found infested with

any dangerous pests the State Entomologist may at his discretion order it to be treated. Any person violating any of the provisions of this act shall be fined not more than fifty dollars. (Amendment approved 5th June 1913.)"

During the year just closed 1,316 boxes and packages of imported nursery stock have been inspected. This stock was contained in 246 separate shipments, and in seven of these insect and plant diseases were found. The insects reported are :—*Lachnus :* An Aphid, sp., on conifers from France ; a specimen of the Chrysomelid beetle *Agelastica* (*Galeruca*) *alni*, L., on a box of ornamental stock and on English Ivy (*Hedera helix*) ; the oyster-shell scale (*Lepidosaphes ulmi*, L.) and an aphis on maple, the last two shipments coming from Holland ; an egg of the Chinese mantid, *Tenodera sinensis*, Sauss., on umbrella pine from Japan ; two specimens of mealy bug on conifers from Belgium ; specimens of a soft scale, *Coccus hesperidum*, L., and of the fig scale on bay trees (*Laurus nobilis*), also from Belgium ; a single Noctuid pupa on a plant of Box (*Buxus*) from Holland, the adult emerging from this pupa being identified as *Mamestra dissimilis*, K. ; and *Aleurodes* on a number of shipments of Azaleas from Belgium.

As a result of the autumn meeting of the Connecticut Beekeepers' Association in 1912, where it was voted to ask for a larger appropriation for inspecting apiaries and to amend the law to make the work more effective, a bill was introduced into the General Assembly, and an Act finally passed, as an " Act concerning the suppression of Contagious Diseases among Bees—Chapter 141 of Public Acts of 1913." This Act repealed Chapter 185 of the Public Acts of 1909 and makes it the duty of the State Entomologist to examine apiaries, to quarantine such as are diseased, and to treat or destroy cases of the disease known as foul-brood. The Act also requires that all shipments and transportations from without the State shall be examined, and in case contagious diseases are found such shipments shall be returned to the consignor or delivered to a duly authorised inspector for treatment or destruction. The statistics of apiary inspection in 1913 and a summary of the inspections for the past four years are shown in tables. With the increased appropriation and authority to inspect without complaint granted by the above Act, which became operative on 1st October 1913, a much larger number of apiaries will be examined next season.

Britton (W. E.) & Caffrey (D. J.). **The Control of the Gipsy and Brown-Tail Moths in Connecticut in 1913.**—*Rept. Connecticut Agric. Expt. Stn. for* 1913, *New Haven*, 1914, pp. 198-223, 2 pls.

The gipsy moth has been all but exterminated in the only two areas known to be infested in Connecticut, Wallingford and Stonington. As a result of scouting for egg-masses at Wallingford, Stonington and other parts of the State, including the vicinity of New London and the town of Thompson, only two egg-masses were discovered at Wallingford, one on the foundation of a house and the other on a fence near this house. Precautions were also taken against the caterpillars and searches made for them, but during the summer of 1913 only three were taken at Wallingford. Scouting was also continued in Stonington, and as a result five caterpillars, one cocoon and

one female moth, which was depositing eggs, were found where no caterpillars had been found since 1910 and no egg-masses since 1911, though the trees have been banded each year. The presence of the caterpillars is not yet understood, unless it be a reinfestation. Tables are given showing the reduction of this pest at Wallingford and Stonington, according to which there were destroyed at Wallingford in 1910, 8,234 egg-masses, 8,936 caterpillars and 96 cocoons, numbers which in 1913 were reduced to 2 egg-masses, 3 caterpillars and no cocoons. At Stonington reduction of the pest is also recorded. In 1906, 73 egg-masses, 10,000 caterpillars and 47 cocoons were destroyed; in 1911, only 3 egg-masses were found; and in 1912, nothing at all; in 1913 there was an increase, 5 caterpillars and one cocoon being discovered.

The result of control measures against the brown-tail moth in Connecticut during the past winter indicates that the area known to be infested has been greatly increased since last year and now includes over 27 towns. In this paper the towns are given with the details and results of scouting. The number of nests have slightly increased in some of the towns and others are infested only to a slight degree. In addition, large infestations were found at Hartford and Suffield. In this work open country was carefully examined and particular attention given to the fruit trees in orchards, around dwelling-houses and along the highways. The brown-tail moth also attacks oak trees in the woodlands, but on account of the leaves hanging on these trees it is almost impossible to detect the nests, and moreover many of them are very far from the ground and it would be very expensive to reach them. For these reasons it is impracticable to scout the entire State and destroy the nests. A table shows the number of nests found and destroyed in each town in 1913 and during the last three years in Windham County. In most there is a marked increase in number from 1912 to 1913.

On account of the presence of the brown-tail moth in Connecticut and the danger of spreading this insect by shipping nursery stock, a quarantine was established by the Federal Horticultural Board, becoming effective on and after 25th November 1912. Later on the quarantine was extended to take effect on 1st August 1913 to include all the present infested area. Nursery stock within this area could not be shipped outside of it unless inspected at the time of packing and duly certified by a Federal inspector. The infested towns, as well as the quarantined area, are shown by a map. The Federal authorities, in co-operation with the State of Massachusetts, have imported into the country all the parasites known to attack both the gipsy and brown-tail moths in the various European and Asiatic countries where these moths occur. The control of this pest by its natural enemies is one of the most promising methods. One of the most effective of the introduced parasites is an Ichneumonid, *Apanteles lacteicolor*, Vier., which attacks the hibernating caterpillars. A Tachinid, *Compsilura concinnata*, Mg., parasitises both the gipsy and brown-tail caterpillars and seems to be well established and spreading freely in Massachusetts. The planting of these along the boundary of the infestation will doubtless reduce the numbers of brown-tail moths and thus check their spread southward and westward. *Apanteles* also attacks caterpillars of the genera *Datana*

and *Hyphantria* (fall web-worm), and *Compsilura* has been reared from the tussock moth, the fall web-worm and the imported cabbage worm.

Walden (B. H.). **A Lepidopterous Leaf-Folder on Privet.**—*Rept. Connecticut Agric. Expt. Sta. for* 1913, *New Haven*, 1914, pp. 223-226, 2 pls.

Many privet hedges in New Haven were attacked during May 1913 by larvae which tied together the terminal leaves, forming an enclosure within which they fed. The adult was a Tortricid moth and determined by Mr. W. D. Kearfott as *Archips rasana*, L. This species was introduced from Europe, where it has been observed feeding on apple, elm, willow, birch, wild rose, raspberry, hazel, linden, aspen, hawthorn, currant and gooseberry. The eggs are laid on the twigs in small flattened, oval masses, covered with a dull waxy substance, the masses laid in the breeding cages containing from 24 to 81 eggs. The eggs hatch from about the 1st to the middle of May. The larva feeds on the tip of the growth where it draws two or more leaves together with silk, thus forming an enclosure within which a single larva feeds and later pupates. The first pupae were found in the breeding cages on 3rd June and the first adults on 10th June. There is one brood each year and the winter is passed in the egg stage. Many larvae had eggs of Tachinid flies deposited on the head and first segment of the body, and the flies began to emerge from larvae collected on 18th June. The species was determined as *Exorista pyste*, Walk. Trimming the hedges will remove most of the infested tips which should be gathered and destroyed to kill the larvae. Some of the larvae will let themselves down to the ground when disturbed and later return to the plants. The hedges should be examined after a few days and any infested tips should be removed. Should this insect become troublesome on currants and gooseberries, it may be controlled by a thorough spraying with lead arsenate at the rate of 2 lb. in 50 gals. of water, soon after the leaves unfold.

Britton (W. E.), & Walden (B. H.). **Field Tests in Controlling Certain Insects attacking Vegetable Crops.**—*Rept. Connecticut Agric. Expt. Sta.* 1913, *New Haven*, 1914, pp. 232-237, 2 pls.

An account of an experiment to test a control for the cabbage fly, *Pegomyia brassicae*, Bouché, is given. Varieties of plants were arranged in order and an area selected for special treatment, namely for the application of tar paper disks. The disks were cut in the form of hexagons, four inches in diameter, from single ply tar paper, and were placed on the stems of plants at the time of setting. Some plants were then "damping off" and failed to recover; others were killed by the cabbage maggot. Of the plants which remained 12 per cent. of the untreated ones and 0·05 per cent. of the disked ones were maggoty.

As a control for the cabbage aphis, *Aphis brassicae*, L., "Black Leaf 40" at the rate of one teaspoonful to a gallon of water, with soap added as a spreader, proved effective and all the aphids were killed. In the tests for a control for the onion thrips, "Black Leaf 40," 1 part to 768 parts of water, and soft-soap; "Black Leaf 40," 1 part to 950 parts of water, and soft-soap; "Scalecide," 1 part to 50 parts of

water, and lime-sulphur, 1½ parts to 50 parts of water, with paste spreader, were tried. None of these was successful. The Scalecide did not coat the onions so well as the "Black Leaf 40" and injured the plants; nor did the lime-sulphur coat the onions satisfactorily.

As a result of testing for a control for the pea aphis, *Macrosiphum pisi*, Kalt., it was found that spray mixtures do not stick readily to the smooth leaf-surface of peas, but gather in drops and roll off. A small amount of common soap dissolved and added to the mixture will usually cause it to spread readily and stick to the foliage. Flour paste did not prove so good a spreader as the soap. Treatments were made in a pea-field and the field was examined after two days. By treatment with "Black Leaf 40" (two teaspoonfuls in one gallon of water, with paste spreader) all aphids hit by the spray were killed, but many live aphids were found on portions of the plants not coated with the spray. The material did not spread so well as where the soap was used. "Black Leaf 40," two teaspoonfuls in one gallon of water, with soap at the rate of 4 pounds to 100 gallons, spread well and very few live aphids could be found. "Black Leaf 40," one teaspoonful in one gallon of water, was just as efficient as where twice the amount of "Black Leaf 40" was used. These sprays did not injure the foliage. Scalecide, one part to fifty parts of water, caused considerable injury to the foliage. There were two varieties of peas in the field, Thomas Laxton and Sutton's Excelsior. No aphids were observed on the former, while the latter was generally infested. If the aphids had been observed at the time they first appeared, when the vines were smaller, the spray could have been applied more thoroughly with much less material. The injury to the vines in driving through the field would also have been much less. The tests with "Black Leaf 40" were quite satisfactory.

**Report for the Year ending July 1913 on the Trade of Smyrna.**—*Diplomatic and Consular Repts., Turkey; Annual Series*, no. 5247, *London*, Jan. 1914.

Reporting upon agriculture in Adalia for the year ending July 1913, Mr. Vice-Consul G. A. Keun mentions the fact that *Icerya purchasi*, Mask., which has greatly damaged groves of mandarin oranges and lemon trees, was considerably checked during the year, not as in the previous year by cold weather, but through the agency of a ladybird, *Novius cardinalis*, which feeds exclusively on *Icerya*. *Novius* was introduced into Adalia from Scio, where *I. purchasi* was also destroying the groves. The *Icerya* pest is now quickly disappearing, being gradually but surely eradicated by *Novius*, which spreads with great rapidity.

Marlatt (C. L.), **The Alligator Pear Weevil.**—*Entom. News, Philadelphia*, xxv, no. 1 Jan. 1914, p.37.

On page 416, Entomological News, xxv, No. 9 [see this *Review*, ii, Ser. A, p. 13], Hawaii and Porto Rico are incorrectly cited as localities in which the avocado weevil (*Heilipus lauri*, Boh.) is known to occur. The only records of this weevil that are known to the author outside Mexico are Central American. Naturally, no quarantine action will

be taken, or is intended, against the islands referred to, or other avocado-producing countries free from this weevil.

FERNALD (H. T.). **Parasites of the San José Scale.**—*Entom. News, Philadelphia*, xxv, no. 1, Jan. 1914, p. 39.

The author states that the parasite reported as doing such effective work against the San José scale in Pennsylvania was discovered at Amherst, Mass., in the autumn of 1912 in great abundance. Specimens were sent to Dr. L. O. Howard, who declared it to be a new species of *Prospaltella*. During the present autumn, colonies of this insect have been sent to Washington and Georgia in the hope of establishing it there. A shipment of the Pennsylvania parasite has made direct comparison possible and there can be no doubt that they are the same species. This insect was described under the name of *P. perniciosi* by Mr. D. G. Tower and the description published in March 1913.

BLODGETT (F. M.). **Experiments in the Dusting and Spraying of Apples.**—*Cornell Univ. Agric. Expt. Sta., Ithaca, New York, Bull.* no. 340, Jan. 1914, pp. 149-179, 1 fig., 1 pl.

In this Bulletin are given detailed accounts of experiments on the dusting and spraying of apples, to determine the effectiveness of a dust mixture containing 20 per cent. of dry powdered arsenate of lead and 80 per cent. of finely divided sulphur, and of a paste containing the same materials with a small quantity of a colloidal substance to keep the lead and sulphur in suspension, to be applied with water as a carrier, as compared with the standard lime-sulphur solution with arsenate of lead and with an unsprayed check. The insects causing most injury to the apples in 1913 were those classed under "Bud moth and other spring caterpillars"; these include leaf-rollers, green fruit worms, etc. From the tables given it is seen that the best control of each of these insects was secured on the dusted plants, with the possible exception of those in which codling moth larvae entered the calyx; there was practically no difference in the insect control between arsenate of lead applied with lime-sulphur and that applied with suspended sulphur, the latter, perhaps, proving more effective for bud moth and other spring caterpillars and for codling moth and Curculio.

KANEHIRA (—). **On some Timbers which resist the Attack of Termites.** —*Indian Forester, Allahabad*, xl, no. 1, Jan. 1914, pp. 23-42.

The author, writing from Formosa, states that termites, or white ants, are amongst the most destructive insects in that island, attacking field crops, buildings and trees. Few dwellings are free from these insects, since in Formosa the houses are mostly made of wood, owing to the expense of other building material. Among the termites attacking buildings are *Coptotermes formosanus*, Shiraki, *Leucotermes flaviceps* and *Termes formosanus*, the method of attack being different in each species. Experiments were made on the power of resistance of Formosan trees against the attack of termites. Pieces of 59 dried timbers and 41 undried timbers were used, each piece, 1′ 5″ long and $1\frac{1}{2}$″ square, being buried perpendicularly with three inches above

ground exposed. Details of the experiments, dates of inspections, etc., are given in tables. As a result of this work, the characters which make timber termite-proof are stated to be :— (*a*) the presence in the wood of some substance which has a strong smell or taste which the insects do not like ; (*b*) the presence of some substance which is poisonous to the insects ; and (*c*) the extreme hardness of the wood, rendering it too hard to attack ; examples of each character being given.

In a note by the Forest Zoologist, Dehra Dun, on Mr. Kanehira's contribution, attention is called to the fact that the durable timbers, while possessing a relative immunity from white ant attack, are, under certain conditions, readily eaten by the destructive species, no absolutely immune species of untreated timber having been discovered by experiment, so far as is known. Definite indications of absolute immunity can only be obtained by actual infection with the termites, since it does not necessarily follow that the buried wood will be attacked.

Rutherford (A.). **Insects on Rubber in 1913.**—*Trop. Agric., Peradeniya,* xlii, no. 1, Jan. 1914, pp. 41-44.

*Hevea brasiliensis* (Para Rubber). In August a Cerambycid beetle (*Moechotypa verrucicollis*, Gahan) was sent in from the Kandy District, where it was attacking rubber stumps, chiefly withered ones. Experiments lead the author to conclude that while this beetle is able to eat the bark with impunity in spite of the flow of latex, it prefers dry twigs. There are records of it on Hevea from Matale and Ukuwela, the last report dating from 1907. The trees attacked should be sprayed with lead arsenate. *Saissetia nigra*, Nietner, the black scale, occurs widely on Hevea in Ceylon. It feeds on the leaves and twigs and is frequently attended by the large red ant, *Oecophylla smaragdina*, which often draws the leaves together to form a shelter over the scales. *S. nigra* is a serious pest of cotton in the West Indies, and in Ceylon occurs in injurious numbers on cotton and *Croton tiglium*. That scale-insects are able to subsist on trees containing latex is proved by the fact that *Coccus viridis*, Green, occurs on the leaves of *Funtumia elastica, Plumeria* sp., *Landolphia kirkii* and *Alstonia scholaris* ; as well as by the fact that *S. nigra* itself flourishes on *Hevea brasiliensis* and *Manihot glaziovii*. *S. nigra* in Ceylon is not so subject to the attacks of hymenopterous parasites as are some allied scale-insects, though the author has reared several specimens of what is very probably *Scutellista cyanea* from the scales on *Croton tiglium*, and has observed that the eggs are subject to the depredations of a Cecidomyid larva. The author thinks no chances should be taken with *S. nigra* and destruction should be effected whenever an opportunity presents itself. The ant is often a nuisance on tea and fruit trees in many parts of Ceylon, and the nests should be broken up and sprayed with kerosene emulsion. Phorid flies were found to have laid their eggs on decomposing smoke-cured rubber, and the maggots were feeding on the products of decomposition. Probably the rubber had been insufficiently dried, as it had developed a mould. The adult flies are small and active and generally lay their eggs in decomposing organic matter.

*Funtumia elastica.* The caterpillars of the Pyralid moth, *Caprinia conchylalis*, Guen., were found feeding on the leaves of *F. elastica* near

Peradeniya on the 10th October. By the 6th November the trees were heavily infested and had a withered appearance due to the dead leaves. A month later only a few withered leaves remained on the tree, and neighbouring trees of Funtumia, that had up till then remained almost free from attack, were beginning to show here and there a withered leaf. This afforded an object lesson of the consequence of neglecting the first stages of an attack. Had a thorough spraying with lead arsenate, at a strength of 5 lb. to 100 gals. water, been undertaken the outbreak would probably have been arrested. Hampson gives the distribution as Sikkim, Assam, Bombay, Nilgiris, Ceylon and Burma. Green records the larva as feeding on *Portlandia grandiflora* and *Holarrhena mitis*. Neighbouring trees of Funtumia were infested with *Coccus viridis*, and the leaves were covered with sooty mould. An undetermined Pyralid larva was feeding on the scales, and they were also attacked by a greyish black fungus. *Pulvinaria* sp. was also present on the leaves, and also not a few specimens of *Lecanium caudatum*, Gr.

*Manihot glaziovii* (Ceara Rubber). Beetles were found boring in several trees that had had their bark skinned during the wet weather in preparation for tapping. One is probably a species of *Xyleborus*, while the other is a long-snouted, slender, dark-brown weevil about 4·5 millimetres long. *Saissetia nigra* has been observed on the leaves of *M. glaziovii*.

*Landolphia kirkii* (African Rubber). A plant of this species in the Botanic Gardens was found infested with *Coccus viridis*, Gr., the leaves being black with sooty mould, and also heavily infested on their under surface with *Ichnaspis longirostris*, Sign.

BARRETT (O. W.). **Cacao Culture.**—*Philippine Agric. Review, Manila*, vii, no 1, Jan. 1914, pp. 5-15, 4 figs.

At the end of this paper on cacao culture, the author notes that a severe pest of this plant in probably all provinces of the Philippines, is the branch-boring beetle [species not stated.] The grub of this insect bores up or down through the centre of the branch causing very severe weakening and final death of the affected portion. Branches suspected of containing these grubs, i.e., those having one or more holes in the bark and showing a weakened condition of the foliage, should be removed and burned. On young plants, scale-insects, aphis, and leaf-eating beetles sometimes do a slight amount of damage but can be easily controlled.

MUNRO (J. W.). **The Variegated Willow Weevil** (*Cryptorhynchus lapathi*, L.).—*Gardeners' Chronicle, London*, lv, no. 1411, 10th Jan. 1914, p. 27, 2 figs.

This weevil has recently been reported from the North of Scotland, where it appears to be more widely distributed than has hitherto been supposed. It is chiefly an enemy of the willow, although it also attacks alder, birch and poplar. Both adult and larva are injurious; the adult gnaws the tender bark of the young shoots, causing them to wilt and die off; the larva eats into the bark of the stem and main branches, almost girdling them, and then bores into the wood itself,

sometimes penetrating into the pith. It pupates in the wood, and may hibernate there.

The damage to the tree may be very considerable; the early work of the larva is the most serious, in that the sap-flow is always reduced, and may even be stopped; stems and branches from 1–6 inches in diameter may be destroyed in this way. The only remedy is to remove all infested stems and branches during the winter months, and burn them. In this way the weevils are destroyed before emerging.

*Icerya purchasi* and *Novius cardinalis* in **Malta**.—*Colonial Reports*, No. 786, *Malta*, 1912-13, *London*, Jan. 1914, p. 12.

In the agricultural section of the report it is stated that during the spring of 1913 there was an outbreak in Malta of the fluted scale-insect, *Icerya purchasi*, in certain localities, but that, owing to the drastic measures taken and the timely distribution of the ladybird, *Novius cardinalis*, the spread of the pest was checked.

Bagnall (R. S.). **Brief Descriptions of new Thysanoptera. II.**—*Ann. Mag. Nat. Hist., London*, xiii, no. 73, Jan. 1914, pp. 22-31.

Of ten new species of Thrips described, two are of economic interest, having been found attacking cultivated plants. These are *Scirtothrips signipennis*, found on the under leaf sheaths of banana in Peradeniya, Ceylon; and *Gynaikothrips karnyi* from the same locality, from marginal leaf-galls of black pepper (*Piper nigrum*).

Busck (A.). **The Chestnut Bast-Miner.**—*Insecutor Inscitiae Menstruus, Washington*, ii, no. 1, Jan. 1914, pp. 3-4, 1 fig.

A description is given of a new species of Tineidae, referred to by Mr. A. G. Ruggles as having an important bearing upon the spread of the chestnut bark disease [see this *Review* Ser. A, ii, pp. 29]. The new species which has been called *Ectoedemia phleophaga*, Busck, is closely allied to the other species of this genus which feeds on chestnut, the gall-making *E. castaneae*, Busck. The larva was found in the lower layer of the bark of a chestnut, encroaching upon the cambium. The mine is slender and serpentine, a few millimetres broad and several centimetres long; in April and May the fully grown larva leaves the mine and falls to the ground, where it makes a cocoon, often boring down a few inches into the loose surface soil. From the specimens reared, imagos emerged during September. The specimen described was taken at Falls Church, Virginia.

Laboy (O.). **A Borracha no Brazil.** [Rubber in Brazil.]—*Minist. da Agric. Indust. e Comm., Rio de Janeiro*, 1913, 153 pp. 99 figs.

The author says that in the rubber districts of the Amazon a species of termite, *Coptotermes marabitanos*, Silv., locally known as "broca," attacks by preference the tapping cuts on the trunks of *Hevea brasiliensis* and is somewhat difficult to combat. Maniçoba rubber (*Sapium*) near Bahia is attacked by the larva of an insect of which the generic name is not given. The author says that at Machado Portella it is attacked by the same form as that found in the

district of Jequié, where, however, it is in most years not very abundant. This is a lepidopterous larva related to the Sphingidae. These larvae eat the leaves, especially in March and April, and also completely destroy manioc plants (*Manihot utilissima*). Zehntner found at Villa Nova a thrips which in various stages was attached to the lower surface of the Maniçoba leaves; as a result of the attack the leaves dry up and fall off prematurely. All green parts of the tree may be attacked and young trees up to two years old suffer most. A spray of 1 per cent. solution of nicotin or petroleum emulsion is useful against them, and it is sufficient to spray the young trees only. Ants are the most formidable pests of *Manihot*. Locusts, amongst them a species of the genus *Tropidacris*, also eat the leaves. Lesne has reported damage to *M. glaziovii* in the district of Baturité by a Curculionid, *Coelosternus rugicollis*, Boh., which in the larval stage bores short galleries into the end of the dead shoots or dead wood on the trunk. A Scolytid, *Xyleborus confusus*, utilises the galleries of *Coelosternus* and prolongs them, invading the whole tree. The best remedy appears to be to examine the trees and cut off all dead branches and see that the wound cicatrises properly.

Poirier (L.). **Réunion viticole à Lyon.** [Meeting of vine-growers in Lyons.]—*Rev. Viticulture, Paris*, xli, 1st Jan. 1914, pp. 17-23.

M. Deville, Director of Agriculture in the Department of the Rhône, recommends lead arsenate against the vine moths, *Clysia ambiguella* and *Polychrosis botrana*, and the flea-beetle, *Haltica ampelophaga*, Guér. Nicotin may be used against the second generation of *Clysia* and *Polychrosis*. M. Jouvet, Director of the Côte-d'Or, stated that *Haltica* was reported at Vosne and at Volnay in the spring of 1913, but was controlled by non-acid sprays mixed with arsenates, which are also effective against mildew. M. Gillin, Director of the Puy-de-Dôme, said that *Rhynchites betulae*, L., had been abundant and the collection of its cocoons was effected in spite of the expense. *Clysia* had been methodically combated with nicotin, arsenic, or copper-nicotin. Bait-traps had been employed against *Polychrosis*. Efficient bird protection is asked for.

Larue (P.). **Tableau indicateur des traitements insecticides.** [An indicator for the use of insecticides.]—*Rev. Vitic., Paris*, xli, 1st Jan. 1914, pp. 23-24, 1 fig.

The author points out that when engrossed in combating mildew the vine-grower often forgets to apply insecticides at the proper time, and a table like the one dealing with *Clysia ambiguella* (Cochylis), prepared by M. L. Fulmek and published by the Vienna Station of Plant Pathology, would be very useful. This table measures 44 inches by 70 inches and on it a disk of 28 inches diameter is printed in colours with instructions in bold type beneath it. The disk is divided into 12 monthly sectors in which the various stages of the pest are depicted, so that a glance at the illustration, followed by reference to the instructions below, gives the required information.

Cazeneuve (P.). **Le danger de l'intoxication arsenicale et plombéique en agriculture.** [The danger of arsenic and lead poisoning in agriculture.]—*Rev. Vitic., Paris,* xli, 8th and 15th Jan. 1914, pp. 29-34, 64-68.

Dr. Cazeneuve, a French senator and proprietor of vineyards in Beaujolais, adduces a large number of instances of poisoning due to lead arsenate used as an insecticide. Besides mentioning these most obvious cases, he refers to the warning given by Lewin, the well-known toxicologist of Berlin University, to the effect that harm may be caused without any immediate apparent symptom, and the serious functional derangement which results may be beyond remedy. On the authority of Lewin, the author states that the use of arsenicals, especially lead arsenate, is forbidden in Germany. As a practical vine-grower, he himself considers that lead arsenate is inefficacious against *Clysia* and *Polychrosis.* The 1913 season in Beaujolais was exceedingly bad for those growers who had continued the use of lead arsenate after the ill-success demonstrated in past years with this insecticide.

**Notice concernant les conditions de vente de la Régie française.** [Note on the sale of Nicotin by the French Régie.]—*Rev. Vitic., Paris,* xli, 15th Jan. 1914, pp. 76-79.

The French Régie sells three varieties of nicotin :—(1) Ordinary standard tobacco-juice, containing exactly either 1 or 2 per cent. of nicotin ; (2) strong standard tobacco-juice, containing exactly 4 per cent. of nicotin ; (3) standard nicotin extract, containing 10 per cent. of nicotin. To ordinary consumers the prices are calculated per kilo. (2·2 lb.) of nicotin actually contained in the liquid, as follows : (1) 25 francs ; (2) 28 francs ; (3) 32 francs in tins of 5 litres each ; 34 francs in tins of 1 litre ; 40 francs in tins of ½ litre.

Feytaud (J.). **Les insectes xylophages de la vine.** [Xylophagous insects of the vine.]—*Rev. Vitic., Paris,* xli, 1st, 8th, 22nd Jan. 1914, pp. 5-7, 41-45, 94-99, 12 figs., 1 pl.

The xylophagous or wood-boring insects of the vine are less familiar to the grower than those pests which attack the leaves and the grapes. They are rarely the cause of the death of the stock or of injury which leads to the discovery of their galleries, as they are nearly always secondary parasites which establish themselves on stocks already weakened by age, by cryptogramic diseases, or by phytophagous or rhizophagous insects. In France the chief wood-borers are : *Cossus, Apate, Callidium, Clytus,* Buprestidae, Tenthredinidae, and termites. The last-named will be dealt with in another paper.

*Cossus cossus,* L., is one of the most dangerous tree-pests. It principally affects the willow, but many fruit-trees, such as the apple, plum, cheery, and fig are attacked, as are also forest and shade-trees such as the elm, poplar, oak, chestnut, maple, ash, plane, etc. The damage is sometimes enormous. Until late years *Cossus* was held to be only a tree-pest, but its larva has been observed attacking vines in Algeria, the Bouches-du-Rhône, the Narbonnais, and the Haute-Garonne. The author has observed this species in some weak stocks in

the Gironde. Strong stocks are generally left untouched, but any weak ones within a short distance of infested willows, elms, etc., are susceptible to attack. Preventive measures then must aim at the removal of trees of this description and, if infested, their speedy destruction, or at least that of larva in them. A hooked wire will often bring away some of the larvae from their galleries, in which a plug of cotton-wool saturated with benzene or carbon bisulphide is then placed and the aperture sealed in order that the remaining larvae may be asphyxiated. The *Apate* bore into the dry shoots, and sometimes also into the living shoots of vines weakened by parasites of the roots (*Phylloxera*, etc.). The species found in France are numerous; *Apate sexdentata, muricata, sinuata, bimaculata, capucina*, and *monacha* being the principal ones. The insects appear in spring and enter the shoots at the base of a bud, boring galleries to the level of the corresponding knot. Mating and oviposition take place there. Four or five weeks afterwards the larvae hatch out and bore longitudinal galleries. They are sometimes so numerous as to destroy the wood between two knots in a few weeks. According to Valéry Mayet, *A. sexdentata* has two generations a year, oviposition occurring in May and September. The spring imagos oviposit on dead shoots, while the autumn brood may attack living ones. This species is found in Southern Europe, North Africa, and Asia Minor; it has been observed not only on the vine, but on fig, mulberry, chestnut, acacia, etc. *A. muricata* is similar to, but bigger than, *A. sexdentata* and causes the same damage. It is found especially in Italy, fairly often in Provence, more rarely in Languedoc. The vine, olive, oak, etc., are attacked. *Apate* (*Xylopertha*) *sinuata* is also found in the South of France and has been observed near Lyons and as far as the Landes. It attacks the oak, chestnut, and vine. *A. bimaculata* is also a southern species. It lives in dead Tamarix wood and also in the vine throughout the entire olive-growing region, in Provence, Italy, Greece, Asia Minor and Algeria. *A. capucina* attacks very hard woods and can even bore stones and leaden plates. It is found chiefly in the trunks of oak, chestnut, plum and mulberry, and on the vine also in the South of France. *A. monacha* is found in warm regions: Southern Europe, Palestine, Abyssinia, North Africa, Senegal and Congo. In Algeria *A. monacha* attacks the shoots of vines weakened by various causes, especially excessive salting of the soil.

The larvae of various beetles of the family CLERIDAE, such as *Denops albofasciatus, Tillus unifasciatus* and *Opilo mollis* prey upon the species of *Apate* in all their stages; while the larvae and eggs are destroyed by various entomophagous Hymenoptera, especially PROCTOTRUPIDAE (*Loelius perrisi, L. tibialis, Cephalonomia formiciformis*) and CHALCIDIDAE (*Pteromalus bimaculatus*).

If injury is being done by *Apate*, the first step is to clear the vineyard, of all cut shoots. If living ones are attacked they must be cut off and burnt, and watering, manuring, etc., must be carried out until the vines have become strong and vigorous, healthy vines being immune. *Clytus varius* is a Longicorn beetle, the larva of which only attacks dead wood. *Callidium unifasciatum*, another Longicorn, attacks dead shoots or living branches of vines weakened by *Phylloxera* or any other cause; but it does so only rarely. *Agrilus deraso-fasciatus*, the Buprestid of the vine, is found everywhere in Europe

and in North Africa. Its larva lives in the bark and liber of the stocks and does little damage. Of the sawflies (TENTHREDINIDAE) *Athalia spinarum* eats the leaves, *Hoplocampa fulvicornis* attacks the grapes, and *Macrophya rufipes* tunnels the pith of the branches.

**Report for 1912-13, East Africa Protectorate.**—*Annual Colonial Reports*, no. 791, *London*, Feb. 1914, p. 30.

During the year under review there was no serious outbreak of any insect pest, although new ones have been met with, and the old ones have been more or less abundant. White grubs were reported to be doing more damage than hitherto, crops on badly cultivated land being most affected. The woolly apple aphis (*Eriosoma lanigerum*) has been found in new localities, and in spite of the inspection of imported trees it has been again introduced into the country. Cut worms in nursery beds have been destructive, especially in the case of tobacco. Numerous bugs and borers have been found on the coffee plantations. A study of these was made, as the coffee industry is likely to be one of some magnitude. Maize to the amount of 9,866 tons was passed for export, of which 628 tons were passed through the fumigating chambers.

PORTCHINSKY (I. A.). **Очеркъ распространенія въ Россіи важнѣйшихъ вредныхъ животныхъ въ 1912 году.** [A Review of the spread of the chief injurious animals in Russia during 1912.] **«Ежегодникъ Гл. Упр. З. и З. по Департаменту Земледѣлія.»** [*Year Book of the Department of Agriculture of the Central Board of Land Administration and Agriculture,*] *St. Petersburg,* 1913, pp. 351-361.

The author opens with a general statement that on the whole, Agriculture in Russia suffered in 1912 considerably from various insect pests. In Asiatic Russia, and also in some eastern and south-eastern governments of European Russia, there were outbreaks of various species of locusts, which have invaded even the province of the Don and some parts of the government of Taurida, where *Caloptenus italicus*, L., has appeared in great numbers. In the north and also in some parts of Middle Russia, the chief pest was *Euxoa* (*Agrotis*) *segetum*, Schiff. It has been observed that these insects do not attack fields on which vetches have grown during the summer; the actual reason of this is not yet known and requires further investigation. Vetches have also proved very useful in combating another grass pest in North Russia, viz., *Chareas graminis*, which, in 1912, totally destroyed the grazing in the district of Jamburg, of the government of St. Petersburg. *Agrotis c-nigrum*, which has been considered to be little injurious, has done damage in the government of Vjatka, where its caterpillars appeared in the first half of May on winter-sown fields, feeding first on weeds and later on the crops. In South Russia considerable damage was done by *Oria* (*Tapinostola*) *musculosa* in the government of Ekaterinoslav. These pests have done more or less damage to nearly 45,000 dessiatines (120,000 acres) of crops, the loss

being estimated at about £250,000. The author refers also to *Phlyctaenodes sticticalis*, *Eurygaster* sp., *Brachycolus noxius*, *Oscinis frit*, and *Pentodon*, and gives some information as to their appearance and injurious activities. In the government of Saratov a Capsid bug, *Anapus freyi*, Fieb., has been reported as injuring grain crops, while in previous years the same pest has damaged pastures and meadows in the same localities. *Coeliodes fuliginosus*, *Hylemyia coarctata* and *Aphis gossypii* (on cottonseeds in the government of Erivan, Caucasia) were also reported from various governments. A new Chalcid pest of clover seeds in Russia, *Eurytoma gibba*, Boh., was discovered by Kurdjumov in seed samples from the governments of Poltava and Kiev, and by the Bureau of Entomology (of the Central Board) in samples sent from the government of Orel; by mowing the clover for seed in autumn it is possible to separate the affected seeds from the healthy ones. The author mentions that the Entomological Station of Voronezh specially studies the biology of larvae of *Agriotes*, while the Station in Tula conducts special studies on *Apion*. Amongst the insect pests of fruit gardens he mentions *Psylla mali*, which affects the orchards of North and Middle Russia, while an undetermined species of *Psylla* is a dangerous pest in South Russia. *Euthrips pyri*, Daniel, is a new pest found in 1912 in the Crimea on apple and pear trees. The artificial importation of *Pentarthron semblidis*—a parasite of *Cydia* (*Carpocapsa*) *pomonella*—into the orchards of Tashkent, which was started in 1911, has resulted in the acclimatisation of the parasites in that country. Various species of *Phyllotreta* have damaged market gardens, while the following pests of forests were reported to the Bureau:—*Agrilus vividus* injured birch trees in the Government of Samara; *Eulecanium corni*, B., appeared on hazel trees in the government of Kazan, the pests passing afterwards to orchards; *Lymantria dispar* was widely spread in the forests in the mountainous parts of the Crimea, where Mokrzecki has discovered a new parasite of it—*Hadronotus* (*Telenomus*) *howardi*.

The author gives also the following information specially relating to Siberia, according to reports received by the Bureau from K. N. Rossikov, who spent there the spring and summer of 1912. In various districts of the government of Enisseissk an outbreak of locusts took place, chief amongst the pests being *Gomphocerus sibiricus*; the egg-clusters have infested an area of 100,000 dessiatines (270,000 acres) and £17,500 was spent in control measures. In the same government the crops were also injured by *Plectroscelis vittula*, *Hydroecia nictitans* and by larvae of ELATERIDAE; the caterpillars of *Euxoa segetum*, in company with the larvae of *Chortophila brassicae* and Aphids, have destroyed a great number of cabbages; *Hylemyia antiqua* was reported as a pest of onions; *Phlyctaenodes sticticalis* was found over the whole government and in some parts has done great damage to vegetables. In the province of Akmolinsk larvae of *Agriotes* and of *Trachea* (*Hadena*) *basilinea* have appeared in enormous numbers; in one locality as many as 50 larvae of *Agriotes* were found on 6¼ square feet, the crops in these fields having been cleared off by the insects.

The Department of Agriculture has published, during 1912, six works on Entomology and republished five books. The author concludes by giving a list of the entomological Stations in Russia, the number of which, including the Bureau of the Scientific Committee to the Central Board of Land Administration and Agriculture, is 24.

The following is a list of towns in which Bureaux exist:—Moscow, Tula, Kursk, Charkov, Poltava, Ekaterinoslav, Cherson, Simferopol, Orel, Stavropol, Vladikavkaz, Astrachan, Tiflis, Tashkent, Kishinev, Kiev, Smiela, Voronezh, Baku, Riga, Orenburg, Kaluga, and Warsaw.

IVANOV (V. P.). **Замариваніе коконовъ Нафталиномъ.** [The destruction (of silkworm pupae in) the cocoon by means of Naphthalin.] — **« Извѣстія Кавказской Шелководственной Станціи »** [*Bulletin of the Caucasian Silk-growing Station*] *for* 1913, *Tiflis*, 1913, pt. 3, pp. 1-8.

The Caucasian Silk-growing Station has made use of naphthalin as a means of destroying the pupae inside the cocoons. The advantages of this method, besides being more convenient than those already in use, are that the cocoons do not lose their brilliance and colour, which is not the case when the pupae are killed by means of steam. The author has been experimenting whether it would not be possible to use naphthalin also in case of cocoons which are intended for industrial purposes, and how far and in what way naphthalin will affect the qualities of the silk wound from such cocoons. As a result he concludes that naphthalin cannot be recommended. The minimum time necessary to kill pupae by means of naphthalin is about 48 hours.

TRJEBINSKI (Dr. J.). **Experiment with Insecticides.—Отчетъ за 1912-й годъ объ организаціи и дѣятельности станціи охраны растеній въ Варшавѣ.** [*Report for* 1912 *on the organisation and activity of the Station for the Protection of Plants in Warsaw,*] *Warsaw*, 1913, 19 pp., 4 figs.

This is a report by Dr. Joseph Trjebinski on the Warsaw Station, which was established in 1911, and consists chiefly of a description of the organisation of the Station (buildings, staff, library, scientific apparatus, collections, etc.) and also short records of some experiments conducted there on remedies against fungus diseases of plants and on some insect pests. So far as the latter class of experiments is concerned, the report mentions:—(1) Experiments against Coccids on *Fraxinus excelsior*: the smearing of the branches of these trees with (*a*) milk of lime, (*b*) "Scalecide" (15 per cent.), (*c*) calcium polysulphide (15 per cent. and 20 per cent.), (*d*) carbolic emulsion (50 cm. of carbolic acid and 20 grms. of soap in one litre of water), (*e*) carbolineum and lime (15 grams of carbolineum and 150 grms. of lime in one litre of water), (*f*) naphtha soap emulsion (25 grms. of liquid soap, $\frac{1}{4}$ litre of water and $\frac{1}{2}$ litre of naphtha, the whole being dissolved in ten times the amount of water), and (*g*) 5 per cent. solution of soda; which showed that the most effective remedies were soda, scalecide and naphtha emulsion, none of which injured the bark of the trees.

(2) Experiments against larvae of ELATERIDAE in strawberry-beds; these consisted in the digging into the soil of lime, saltpetre, sulphate of iron dissolved in liquid manure, and in burying trap potatoes; the results showed that while lime and saltpetre keep away the larvae from the roots of strawberries for a short time only, sulphate of iron has no effect at all, and the larvae were found in the potatoes only after the expiration of two weeks.

(3) Experiments against the larvae of *Melolontha* with $\frac{1}{2}$ per cent. and 1 per cent. of Schweinfurt green sprayed on the roots of trees have failed, in nature as well as in the laboratory, as the insecticide did not affect the larvae, but injured the trees, causing the leaves to fall off.

**Неудача съ яйцеѣдомъ плодожорки.** [Failure with the parasite (*Pentarthron semblidis*) of *Cydia pomonella.*]—**«Туркестанское Сельское Хозяйство»** [“*Agriculture of Turkestan,*”] *Tashkent*, Dec. 1913, pp. 1198-1200.

An editorial note records a serious outbreak of *Cydia* (*Carpocapsa*) *pomonella* in the orchards of Tashkent in 1913 and the apparent failure to obtain the favourable results which have been expected from the parasites of the eggs of this pest imported from Astrachan. A case of one orchard is mentioned in which a small number of the parasites were released in September 1911; they hibernated in good condition, but developed in great numbers only at the end of the next summer, evidently having required the first half of the summer for multiplication. In the autumn of 1912 there was not a single apple in this orchard which was not infested by *C. pomonella.* Owing to the great number of parasites which were noticed at the end of that summer, it was expected that the number of hibernating specimens would be greater and that the latter would develop and prove more useful in 1913; but it appeared that the number of parasites in 1913 was very small, while the numbers of *C. pomonella* were enormous. The writer of the article is at a loss to explain the reason for this failure and suggests that either the parasites themselves destroyed last summer all the eggs in which they could have wintered, or that they have been removed from the orchard with the harvest of apples. In view of the serious injury done to the orchards of Tashkent by the pest and to the failure or cost of other remedies, it is suggested that evidently the parasites must be bred artificially in the laboratory of the Entomological Station and let loose in the orchards early in spring.

**A Suggestion for trapping** *Pachydissus sartus.*—**«Туркестанское Сельское Хозяйство»** [“*Agriculture of Turkestan,*”] *Tashkent*, Dec. 1913, pp. 1226-1228.

A correspondent suggests as a remedy against the Longicorn, *Pachydissus sartus*, Sols., the use of trap trees, the bark on some parts of which has been removed to expose the wood. He contends that such trees would attract the beetles, and could be destroyed as soon as they had become infested. This method is successfully applied against various SCOLYTIDAE. In a reply, V. Plotnikov does not approve of this method under the conditions prevailing in Turkestan, where there are no large forests. Besides he is not satisfied as to the suggested method of preparing the trap trees, for his experience has proved that these beetles are not attracted to rings on trees made by removing the bark; and even if the trees should be cut down and left lying, he doubts whether they would attract the insects in sufficiently large quantities. Pending further investigations, he repeats his previous recommendations, *i.e.* to remove and burn the damaged trees before the spring and again later in the season.

## NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

---

## CONTENTS.

CONTENTS—*continued.*

VOL. II. Ser. A. Part 4.—pp. 201-272. APRIL, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

Kulagin (N. M.). **Главнѣйшія вредныя насѣкомыя для полеводства въ Европейской Россіи въ послѣднее двадцатилѣтіе.** [The principal Insect Pests of field-crops in European Russia for the last 20 years.]—**Ежегодникъ Гл. Упр. З. и З. по департаменту Земледѣлія**, [*The Year-book of the Department of Agriculture of the Central Board of Land Administration and Agriculture*], *St. Petersburg*, vi, 1913, pp. 585-638, 1 plate.

The author reviews in this article the appearance and distribution of and damage done by the principal insects injurious to field-crops for the past 20 years in Russia, together with the more important measures for fighting the pests undertaken by the Zemstvos. He first deals with *Anisoplia austriaca*, Herbst, and gives a table showing the years of the appearance of this beetle in 25 different governments of South and Middle Russia for the period 1894–1912. It appears that this insect is a constant pest in the governments of Cherson, Taurida, Ekaterinoslav, Kiev and Charkov, while in most other parts, even in South Russia, it occurs much less frequently. In some years, such as 1897, 1900, 1901, 1910 and 1912, the insects appeared over a very wide area; while in other years, such as 1904–1907, only five governments complained of their depredations. In some districts the beetles appear during a number of successive years, but most frequently there is an interval of 2–3 years in their appearance in the same area, while in other cases—Bessarabia, Stavropol—this interval reaches 7–8 years.

*Mayetiola* (*Cecidomyia*) *destructor*, Say, has been noticed in 41 governments, a list of which, with the years of the appearance of the pest, is supplied. It appears that it has been found as far north as Pskov (1894 and 1904) and Viatka (1898) and in most parts of Middle and South Russia, but the damage done by these flies is more constant and chronic in the southern governments, while the outbreaks in Middle Russia and in the north take place at longer intervals. As a rule their multiplication depends a great deal on the meteorological conditions of the spring and autumn, a rainy spring being favourable for their development; but the author points out some years which proved exceptional in this respect.

*Oscinis frit*, L. Records are given of the appearance of this pest in 21 governments, from 1894 to 1912, as well as information as to outbreaks since 1837, when one took place in Kurland. In Bessarabia this fly is considered to have been the chief pest of field-crops during recent years. The author mentions the fact that only in those governments where there are entomological organisations is the damage by these insects kept on record separately from that done by *Mayetiola destructor*. As a rule these two flies become abundant in the same years, although contrary cases are also known. It is stated that *O. frit* sometimes appears persistently in a limited locality, as is the case in the experimental fields of the Moscow Agricultural Institute, where they cause considerable damage every year.

*Cephus pygmaeus*, L., and *C. tabidus*, F., have been recorded in 26 governments, and a table is given with information as to their appearance in each year from 1893 to 1912. They are more injurious and

appear more frequently in some southern governments (Cherson, Taurida, Ekaterinoslav, Charkov). The damage caused by these pests is variously estimated at from 14 to 20 per cent., although there are cases in which the damage was much more serious. In 1912, in the government of Kiev, these insects only attacked fields already damaged by *M. destructor*.

*Euxoa* (*Agrotis*) *segetum*, Schiff. Records have been compiled of the appearance of this important pest in 34 governments, it being found as far north as Vologda, St. Petersburg, and Viatka, where it was noticed in 1838. In the government of Tula the caterpillars have appeared in great numbers every year from 1901 to 1910, with a sudden decline in 1907. The intervals between the years of maximum occurrence vary in different parts of the country. Sometimes the pests do little damage, although appearing in great numbers, as was the case in Tula in 1910.

*Oria* (*Tapinostola*) *musculosa*, Hb., is a South Russian pest; from the table supplied it appears that it has been observed in 10 governments. The intervals between outbreaks are considerable.

The author deals in the same way with *Locusta* (*Pachtylus*) *migratoria*, L., and various other species of locusts; also with Thrips (which are tabulated for 18 governments); the Pentatomid bugs, *Eurygaster maura*, F., *E. marrocana*, F., *E. integriceps*, Osh. (in 11 governments, mostly in South Russia); the Elaterid beetles, *Agriotes segetis*, Bjerk., and *Athous niger*, L. (in 19 governments); *Hydroecia nictitans*, Bkh. (in 14 governments of South and North-east Russia, the most frequent outbreaks having occurred in Ufa); and with *Lema melanopa*, L., which is recorded fron 9 governments of South Russia.

With regard to the general factors influencing the occurrence and periodicity of insect pests, the necessity for further research is emphasised. The first Zemstvo to appoint an Entomologist was that of Taurida in 1893, Cherson being the next to follow this example, in 1897. Some Zemstvos while not having a permanent Entomological Station, invite yearly the services of specialists or apply to the Central Government for such men. Other Zemstvos assign this task to their "agronomists," who give popular lectures to the peasants on various insects and remedies for them, with demonstrations, leaving the actual combating of the pests to the public, though in some cases they also supervise the technical part of the campaign. The author proceeds to review other activities of the Zemstvos, so far as the fight against insect pests is concerned, which include :—bye-laws regulating the campaign against any particular pest; the issue of posters, pamphlets, etc., acquainting the public with the various aspects of this question; the supply, sometimes on advantageous terms, of sprayers, insecticides, fungicides, tanglefoot, etc., to the public; subsidies to various Agricultural or Natural History Societies; the payment of premiums for the collection of various pests, etc.

The author gives a list of the literature used by him for his review, and goes on to describe more fully the control measures against *Euxoa segetum*, *Mayetiola destructor*, and *Anisoplia austriaca*.

LECAILLON. **Sur la fécondité du Négril des luzernes** (*Colaspidema atra*, Latr.). [On the fecundity of *Colaspidema atra*, Latr.]—*C. R. Acad. Sci., Paris*, clviii, no. 2, 12th Jan. 1914, pp. 137-139.

The small beetle, *Colaspidema atra*, Latr., called in France "Négril," on account of its black colour, causes serious damage every year to lucerne crops in the neighbourhood of Toulouse. It is common in other parts in the south of Europe. In May and June the hibernating adults appear, and soon after the larvae are found in the fields of lucerne. The present paper deals with experiments made to determine the number of eggs laid by the female during her lifetime, and the results indicate that a single female may lay almost 1,000 eggs from April to June. This degree of fecundity was maintained both when fertilisation occurred only once or was repeated several times. The degree of fertility in different individuals was very variable.

LAMBORN (W. A.). **The Relationship between certain West African Insects.**—*Trans. Entom. Soc. London for* 1913, *London*, iii, 21st Jan. 1914. pp. 436-524, 4 pl.

The observations recorded in this paper, upon the relationship between certain insects, were made at Oni, in Southern Nigeria, in a bush camp, situated 70 miles E. of the town of Lagos and about 10 miles from the sea. Although most of the work done is of purely scientific interest, certain points are noted which are of economic importance. The larvae of three Lycaenid butterflies, *Aslauga vininga*, Hew., *A. lamborni*, Bethune-Baker, sp. n., and *Spalgis lemolea*, H. H. Druce, were found to feed on Coccids ; and the same habit is recorded of the larvae of two moths, *Eublemma ochrochroa*, Hmp., and *Tortrix callopista*, Durrant, sp. n.

In an account of the Homoptera (PSYLLIDAE and COCCIDAE) collected by Mr. Lamborn, Prof. Newstead describes a new species of Psyllid, *Rhinopsylla lamborni*. The Coccids collected were *Stictococcus sjöstedti*, Newst., one of the recognised cocoa pests of Western Africa, *Pseudococcus* (*Dactylopius*) *longispinus*, Targ., *P. virgatus* var. *madagascariensis*, Newst., and *Lecanium punctuliferum*, var. *lamborni*, var. n.

BRAUCHER (R. W.). **An Undesirable Foreigner on the American Continent** (*Cryptococcus fagi*, Baerens).—*Canad. Entom., London, Ontario*, xlvi, no. 1, Jan. 1914, pp. 14-15.

The author received, in October 1913, specimens of bark from a common beech tree covered with an insect which was stated to be noticeable all through the woods in the vicinity of Halifax, N.S. Dr. Howard identified it as the European felt scale (*Cryptococcus fagi*, Baerens). In Britain this insect confines its attacks to the beech (*Fagus sylvatica*), the copper beech being all but immune. The specimens from Nova Scotia are doubtless from the American beech (*F. grandifolia*, Ehrh.), an entirely new food-plant, and prompt measures should be taken for its extermination, since it would appear that the insect is taking well to its new conditions. This seems to be the first record of the occurrence of this Coccid in North America.

Hewitt (C. G.). **Note on Occurrence of the Felted Beech Coccus (*Cryptococcus fagi*, (Baerens) Dougl.) in Nova Scotia.**—*Canadian Entomologist, London, Ontario*, xlvi, no. 1, Jan. 1914, pp. 15-16.

Dr. Hewitt, after reading Mr. R. W. Braucher's article on *Cryptococcus fagi*, notes that in August 1911 specimens of the felted beech Coccid, *C. fagi*, were sent to him by Mr. Justice Meagher of Bedford, N.S. Investigation then showed it to be present on both ornamental and forest beeches in the neighbourhood of Halifax, where it has existed for years, Mr. R. Power, Superintendent of the Public Gardens, Halifax, having known it for twenty years. Efforts should be made to prevent its spread. Theobald has found the Woburn Wash of Mr. Spencer Pickering to be a most successful remedy. This is made as follows :—Soft soap, ½ lb. ; kerosene, 5 pints ; caustic soda, 2½ lb. ; water, 9½ gals. The soap is dissolved in hot water, then the oil mixed in, then the soda, and the whole brought up to ten gallons with water. An effective summer wash is made by boiling together 8 lb. soft soap and 5 gals. of kerosene. On cooling this becomes a jelly, and for use 10 lb. of the jelly is added to 30 gallons of water. The best results have been obtained by scraping off the Coccids and scrubbing with the kerosene wash.

**Meeting of the Entomological Branch, Ottawa Field Naturalists' Club.**—*Ottawa Naturalist, Ottawa*, xxvii, no. 10, 30th Jan. 1914, pp. 135-139.

At the meeting of the Entomological Branch held on 8th Jan. 1914 some oak twigs were shown from Meach Lake, Que., from which had been reared the Cerambycid, *Elaphidion parallelum*. The larva tunnels the twigs for several inches and pupates in them, finally emerging through the base of a broken twig. This beetle is related to the Oak Twig Pruner, *Elaphidion villosum*, which was injurious to oaks in the St. Lawrence Island Parks in 1912 and 1913. The habit of the latter species is to girdle the twigs, causing them to drop.

Another subject discussed was the habits and life-histories of the various species of June Beetles (*Lachnosterna*) ; it was stated that the distribution of the various species is often quite local, owing to each having preferences in matters of soil and moisture in their breeding places. When hibernating some species remain at a depth of less than a foot below the surface of the soil, while others have been found at depths varying from 47–91 inches. Mention was also made of the remarkable manner in which skunks seek out the larvae for food, thereby doing much good.

Grove (A. J.). **Some experiments with Maize stored in bins.**—*Agric. Jl. of India, Calcutta*, ix, pt. 1, Jan. 1914, pp. 92-98.

In October 1912 some experiments were started to test methods for protecting stored maize, kept for feeding cattle, from the attack of insects. The grain to be treated was kept in large cylindrical bins. One bin contained maize which had been fumigated with carbon bisulphide ; a second, maize that was unfumigated, but in which naphthalene was suspended in muslin bags ; in a third the maize was fumigated and naphthalene was also used. A fourth containing

unfumigated grain and no naphthalene served as a control. The insects found were *Rhizopertha dominica*, *Tribolium ferrugineum*, and *Calandra oryzae*; of these *T. ferrugineum* is harmless, living merely in the dust amongst the grain. The results show that storing with naphthalene it practically as effective as fumigation with carbon bisulphide; that it has no bad effect on the grain from the point of view of its suitability as food for cattle and that it does not alter the germinative capacity to any appreciable extent. It has the following advantages over fumigation with carbon bisulphide:—It is easy to use, and is less dangerous, no special apparatus being necessary; the cost is less and the effect is continuous, whereas carbon bisulphide must be allowed to evaporate and any insects which gained access to the grain after that would breed unchecked.

In the experiments described, flake naphthalene was used at the rate of 1 lb. per bin, the bin being 6 ft. high and 3 ft. in diameter, holding between 25 and 30 maunds (2,000–2,400 lb.) of maize. The naphthalene was divided into four parts, each of which was wrapped in a muslin bag and suspended at different levels in the bin. It is important that the naphthalene should not mix with the grain, and before feeding the grain to cattle it should be exposed to the sun for from 6 to 12 hours.

ADCOCK (G. H.). **Phylloxera.**—*Jl. Dept. Agric. of Victoria, Melbourne*, xii, pt. 1, Jan. 1914, pp. 51-55, 3 figs.

An account is given of the habits and life-history of *Phylloxera vastatrix*, with an historical description of its discovery in America and its introduction and spread in Europe. In 1875 it was introduced accidentally into Victoria in some vines imported from Europe; the first attacks were noticed near Geelong. Under legislative authority whole areas of vines were destroyed to annihilate the pest, but in spite of this further attacks occurred in the Bendigo, Goulburn Valley and Rutherglen districts, where similar measures were taken, but with as little success. These attacks caused a considerable set-back to the important industry of viticulture in Victoria; it is, however, steadily recovering, owing to the reconstitution of the vineyards with American resistant vines.

HEMPEL (A.) **As Cigarras do Cafeeiro.** [Coffee Cicadas.]—*O Fazendeiro, S. Paulo*, vi, no. 3, March 1913, pp. 92-93, 6 figs.

The author figures and briefly describes *Fidicina pullata*, Berg, and *Carineta fasciculata*, Ger. These two species occur together in Brazil, though the former is more numerous in Caconde and the latter in Campinas and Itatinga. They were first noticed by coffee-planters in 1904 in Caconde, and have since been recorded from various widely separated localities in the State. On uncultivated land the insects feed, in their larval and nymphal stages, upon the roots of indigenous trees. When the bush is cleared and coffee planted on the same ground, the nymphs speedily adapt themselves to the new conditions and feed upon the roots of the coffee trees, doing considerable damage. It is recommended that when the presence of cicada nymphs is suspected the soil should be turned over round the roots of the coffee.

**La Langosta.** [Locusts.]—*Bol. Fomento, San José, Costa Rica*, iii, no. 11, Nov. 1913, pp. 830-831.

The following experiment was made in Nicaragua upon a swarm of locusts which covered an area of 500 yards by 200 yards. This swarm had proceeded in a solid column eating up everything which it encountered in its path. A poison was prepared with 1 lb. of arsenate of soda mixed with 4 lb. of brown sugar and dissolved in a large vessel of boiling water; cold water was then added in a quantity sufficient to make 10 gallons of the solution. Six good handfuls of green barley (any other sort of green fodder may be used), weighing altogether 36 lb., were dipped in the arsenical solution for 15 or 20 minutes until completely saturated. The poisoned barley was then distributed over the greater part of the swarm. The first effect was to stop the advance. The locusts attacked the bait with great voracity, consuming the whole of it. The next morning the few that were not dead were intoxicated and died quickly when sprinkled with a little of the solution. The living, as usual, ate the dead and large numbers were killed in this way. In about four days the whole swarm was destroyed. The author notes that a number of birds which ate the poisoned locusts did not appear to be in any way affected.

Gorkum (Dr. N. van). **Dactylopius sacchari brasiliensis.**—*Boletim da Estaãço Experimental de Canna de Assucar de Escada, Estado de Pernambuco, Recife*, i, no. 1, April-June 1913, pp. 29-31, 1 pl.

This scale-insect is found in various stages of development chiefly on that part of the stem of the sugar-cane which is just below the surface of the soil and on the crown of the roots. The bugs also crawl up the stem and attach themselves to the underside of the leaves, preferring the young shoots. The presence of the insect is indicated by the intense red colour which the leaves acquire at their base. This scale will live on any species of cane, even on *Saccharum spontaneum*, a wild species, and the damage done is such as to interfere greatly with the growth of the plant. Any direct and radical remedy is very difficult of application, because the bugs tend to collect between the stem and the leaves, and the latter cannot be removed without damage to the plant. The best remedy is to disinfect the cane thoroughly before planting with Bordeaux mixture, which kills both the bugs and the eggs.

The author thinks it possible that the various species recorded from sugar-cane in different parts of the world are possibly only varieties of one species, and in order to distinguish the insect which he himself has dealt with and which was found for the first time in the State of Sergipe, he proposes to call it *Dactylopius sacchari brasiliensis*, sub. sp. nov., a brief description being given.

**Plagas de la Agricultura.** [Pests of Agriculture.]—*Bol. Minist. Agric. Buenos Aires*, xv, no. 5, May 1913, pp. 520-521.

A table is given showing the destruction of locusts in the various provinces of the Argentine, from which it appears that 2,381 tons of insects were destroyed in the month of April 1913.

BROGGI (A.). **Monografia Sobre el Cultivo del Algodon en la Republica Argentina.** [The cultivation of Cotton in Argentina.]—*Reprint from Bol. Minist. Agric. Buenos Aires*, 1913, 22 pp.

The author mentions that although there is nothing which can be called a serious pest of cotton in the cotton-growing districts of the Argentine, yet the cotton worm, *Alabama argillacea*, is fairly common, but can be easily combated by the use of Paris green in powder at the rate of 1 to 2 lb. per acre.

SALVADORES (A. Z.). **El Durazno.** [The Peach.]—*Reprint from Bol. Minist. Agric. Buenos Aires*, 1913, 33 pp., 56 figs., 17 pls.

Amongst the pests of peaches in the Argentine, the author names *Aulacaspis pentagona*, and recommends for its destruction neutral "Acaroina," 4½ per cent. solution in summer and 15 to 20 per cent. in winter. Calcium sulphides may also be used in winter, being prepared by boiling 12 lb. of lime in 4 gals. of water and adding 8 lb. of sulphur in powder; 4 gals. of water are then added, and the whole boiled for two hours. Both preparations should be laid on with hard brushes, but sprayers may be used for the upper parts of the trees. Attempts are being made to acclimatise certain enemies of the scale, especially the Coccinellid, *Rhizobius lophantae*, and various Chalcids of the genus *Prospaltella*. There is a native Coccinellid (*Coccidophilus citricus*) which is generally to be found in summer on lemon and orange trees in the province of Buenos Aires, and appears to feed upon *Lepidosaphes beckii*, which is a pest of these plants. It has also been observed o have a predilection for *Aulacaspis* (*Diaspis*). The artificial propagation of this insect is advocated.

*Aphis persicae* (the peach aphis) attacks the tender shoots and leaves, killing them and thereby causing the death of the tree. It can be controlled by spraying the affected parts in spring with a 5 per cent. extract of tobacco. The operation should be carried out in the evening and again on the following morning. The tree should subsequently be sprayed with water in order to remove the nicotin. A 5 per cent. solution of lysol with 0·6 per cent. of soft soap in water may also be used. It is useful in winter to brush the trunks of the principal branches with milk of lime. The plants that have been attacked in the previous spring and summer, and especially the ends of the one-year-old branches, should be washed in every part with a 3 per cent. solution of soft soap. It is also desirable to collect and destroy the tips of badly attacked branches, and all trimmings and prunings.

**An Act Respecting the Protection of Plants from Destructive Insects and Fungoid Diseases.**—*Quebec Assembly Bill*, no. 32, 1913.

Under this Act the Entomologist of the Department of Agriculture of the Province of Quebec is given the right to enter any nursery, orchard, or other premises where it is believed that plants are kept, and any resistance to this action is forbidden. The existence and spread of any insect pest must be reported, and all instructions regarding the treatment or destruction of infested plants must be carried out by the owners. After the Entomologist has ascertained the existence in a nursery of any one of the pests enumerated, no plants may

be removed from that nursery until a certificate stating that they are fit to be transferred has been obtained from the Entomologist or his assistant. The Minister may authorise certain persons, for scientific purposes only, to import specimens of the destructive pests. No compensation for expenses incurred or damages suffered through the treatment or destruction of any plants, trees, or other vegetable matter attacked by any of the destructive pests shall be allowed by any court when such expenses result from the instructions of the Entomologist. Among the destructive insects to which this section applies are expressly included the San José Scale (*Aspidiotus perniciosus*, Comst.), the brown-tail moth (*Euproctis chrysorrhoea*, L.), the gipsy moth (*Lymantria* (*Porthetria*) *dispar*, L.), and the woolly aphis (*Schizoneura lanigera*, Hausm.) Between the 15th June and the 15th September of each year the Entomologist or his representative shall visit all nurseries in the Province in which plants are grown for commercial purposes, in order to ascertain the existence in such nurseries of any of the destructive insects or plant diseases, and if such insects are not present a certificate shall be issued which is valid up to the inspection next year. Unless such a certificate is obtained, after the 15th December 1914 every owner or person in charge of a nursery in the Province is forbiddedn to move any plant outside the nursery.

PATCH (E. M.). **Woolly Aphid of the Apple.**—*Maine Agric. Expt. Sta., Orono, Bull.* no. 217, Oct. 1913, pp. 173-118, 6 pls.

This Bulletin is practically identical with Bulletin 203 [see this *Review*, A, i, pp. 24-26].

PATCH (E. M.). **Woolly Aphids of the Elm.**—*Maine Agric. Expt. Sta., Orono, Bull.* no. 220, Nov. 1913, pp. 259-298, 6 pls.

The author deals with the elm aphids of the Eastern United States belonging to the genus *Schizoneura*. Among the points of specific value in separating these aphids are the antennae of the stem females, the wax glands of the apterous generations and the antennal characters of the winged females. The habitat and the species of the elm concerned are also of much significance. Among the species considered in this bulletin is the woolly aphid of elm bark, *S. rileyi*. It is not uncommon to find the trunks and branches of young elms with the tender places in the bark closely packed with colonies of this species. Descriptions of the distinguishing features of the different generations are given, the antennae especially being described and illustrated. Elm rosette or leaf-cluster aphid, *S. lanigera*, and the northern curl of American elm, *S. americana*, are here treated separately, though the author states that there seems to be no ground for separating the two except the nature of their elm habitat [see this *Review*, Ser. A, i, pp. 24–26.] The author also notes that the life-cycle of the leaf-roller of elms, *S. ulmi*, includes a residence on the roots of currants and gooseberries, the form which occurs on *Ribes* being known as *S. fodiens*. Specimens identical with *S. ulmi* (*fodiens*) have been collected in California, Oregon, Maine and Ontario.

The Bulletin concludes with a food-plant catalogue of the APHIDIDAE of the world.

Fletcher (T. B.). **List of Insect Pests of Cultivated Plants in Southern India.**—*Madras Dept. Agric., Coimbatore,* note no. 1 of 1913, 8th Oct. 1913, 15 pp.

This is a list of the principal crop-pests of Southern India, and contains information regarding 275 different species, giving their distribution, the crops they attack, and remarks as to their relative importance. The list does not purport to be complete, as new pests are constantly coming to light. The insects dealt with are referable to the following orders :— Hymenoptera 5 species, Coleoptera 61 species, Diptera 8 species, Lepidoptera 119 species, Rhynchota 64 species, Orthoptera 15 species, Isoptera 2 species and Thysanoptera 1 species. It should prove a very useful pamphlet, and the tabular arrangement adopted is very handy for reference.

Molz (E.) **Chemische Mittel zur Bekämpfung von Schädlingen landwirtschaftlicher Kulturpflanzen.** [Chemical means of combating pests of cultivated plants.]—*Zeits. Angewandte Chemie, Leipzig* xxvi, nos. 77 & 79, 26th Sept. 1913 and 3rd Oct. 1913, pp. 533-536, 587-588.

The paper deals with the chemistry of insecticides and fungicides, the action of chemicals upon insects and parasitic plants and on the host plant, and with the possible risks of injury to man or animals by the use of these substances.

Copper sulphate, which has long been used as a fungicide, has only of recent years been regarded as a useful insecticide. Guillon in central and southern France found that a copper-lime mixture was effectual against grasshoppers, and in 1911 the author, as the result of direct experiment, found that the same mixture protected foliage from the attack of caterpillars ; in both cases the effect being due not to the lime, but to the copper salt. It was found that solutions containing less than 2 per cent. of copper sulphate were useless, to which fact is attributed the failure in certain cases to destroy pests with this preparation.

Sulphur is a useful remedy against many insects, especially against red spider (*Tetranychus*) and flea-beetles, e.g. *Haltica ampelophaga*, upon which it acts not only as a direct poison but as a repellant. In some cases this has had the undesired effect of driving away insects which are useful in destroying harmful insects, as in a case observed by the author when the application of sulphur to vines to rid them of the vine moth resulted instead in the destruction of the earwigs, a natural enemy of these pests. Sulphur is often applied in the form of a polysulphide of potassium ($K_2 S_5$), the liver of sulphur of commerce. Liver of sulphur must not be used stronger than 1 lb. in 20 gals. of water, otherwise the foliage is damaged. The author prepared a very satisfactory mixture as a remedy for red spider by adding 23 per cent. of soft soap to the liver of sulphur mixture, whereby the efficiency was greatly increased. More important than liver of sulphur is the lime-sulphur mixture. In America this has proved a valuable remedy against the San José scale (*Aspidiotus perniciosus*), and has been used successfully in Germany, where it is known in commerce as " Californische Brühe." It is prepared by boiling a mixture of

burnt lime and powdered sulphur in a small quantity of water; in concentrated solution it is a brownish-yellow liquid, and can be easily diluted with water. The quick lime, sulphur and water are boiled in an iron vessel. The formula used in America is as follows:—1 part by weight quicklime, 2–2·25 parts sulphur and 9–11 parts water. The lime must be as pure and as fresh as possible, otherwise it contains a large quantity of carbonic acid, which renders it useless. As a by-product calcium thiosulphate ($CaS_2O_3$) is formed, which is soluble in water, but which, on standing in the air, precipitates as insoluble calcium sulphite ($CaSO_3$) and free sulphur; the calcium sulphite remains at the bottom of the vessel and the sulphur enters into fresh combination with the lime. Lime-sulphur mixture may be prepared either in the concentrated form or ready for use. In the former case 42 lb. sulphur and 19 lb. lime are used to 22 gallons water. For winter spraying the proportions are 8 lb. sulphur and 10½ lb. lime to 22 gals. water. The boiling should not last over an hour. When the liquid is cool its specific gravity is tested by means of a Beaumé's hydrometer. In America the commercial product is 32–34° Bé., in Germany usually 20° Bé. The mixture should be used as soon as possible, but it may be kept in well-closed vessels for a month. Contact with the air causes precipitation of reddish brown crystals of the pentasulphide and tetrasulphide of calcium.

Carbolineum is now recognised as a universal remedy against insect pests, as a result of much experimental work done notably by Aderhold, Hiltner, Lüstner, Schander, Fulmek, Zimmermann, Wahl and Schwartz. Carbolineum is a distillation product of coal or wood tar. Soluble carbolineum is prepared in commerce in many forms and under various names. Netopil (1909) showed that the commercial products differed widely in their chemical and physical characters, and Aderhold and Lüstner showed that some of these products were actually harmful instead of beneficial to plants. With the purpose of ascertaining what in such products were beneficial and what harmful, the author conducted some experiments in 1909 and 1910 in the Flörsheim chemical works. In these experiments 30 different tar-oils were tried, including raw tar-oil, phenol-free tar-oil, base-free tar-oil, phenol and base-free tar-oil, raw base and raw phenol from tar-oil. Of each kind of tar-oil, 2 light oils, 3 medium oils and 2 heavy oils were tried. The results were shortly as follows. Insecticidal action is most marked with light oils. Aphids were killed by all the oils, but the oil entered into the galls and destroyed the adjoining tissues; this was less marked in the case of heavy oils than with medium or light oils. Soluble tar-oil can be used in 10 per cent. solution against Aphids, but it must not be allowed to touch the green parts of the plant. Against caterpillars the best results were obtained with the bases and phenol from the tar-oils. A 5 per cent. solution in water of raw phenol is sufficient to kill caterpillars of *Pieris brassicae*, the efficiency rising with the concentration. Green parts of plants are sensitive to a 0·5 per cent. solution, so that carbolineum is only really satisfactory when used before the trees are in leaf. For killing insects in the ground light oils were the best, but these were only satisfactory for insects near the surface of the soil. Damage to foliage is greater in the case of heavy oils than of lighter oils, and of all the constituents of tar-oil the phenol is the most harmful to plant tissues.

Soap is an important contact insecticide, and most contact poisons contain it in greater or lesser proportions, such as, for example, quassia-soap mixture, Dufour's worm poison and Nessler's remedy for Aphids. The most essential character of a contact poison is its power to soak into the hairy or waxlike covering of insects. This power depends, according to VERMOREL and DANTONY (1910), on the surface tension of the liquid used; this can be measured by counting the number of drops formed by 5 c.c. of the liquid when passing through a pipette that allows 5 c.c. of distilled water to pass out in 66 drops. For beetles, such as *Haltica ampelophaga*, *Rhynchites betuleti* and *Adoxus vitis* a soap solution of strength 5 : 10,000 is sufficient to kill; this strength corresponds with a surface tension of 192 drops for 5 c.c. of the liquid. For the webs of *Hyponomeuta* a solution of 1 : 1,000 must be used. The addition of soap to insecticides is principally to increase their power of moistening the coat of the insect; to mixtures which contain acids or inorganic salts it is useless to add soap, as the latter will be precipitated.

Nicotin is an important ingredient in many insecticides. In the form of tobacco extract it is an important contact poison; more recently it has been found to be an efficient stomach poison and has been used successfully against *Clysia ambiguella* and *Polychrosis botrana*.

Still more important than nicotin as a stomach poison is arsenic, in the form of Schweinfurt green and lead arsenate. The question as to whether the fruit is poisoned on trees treated with arsenic compounds has occupied attention; probably there is no risk, as the spraying is carried out, in the case of vines, for example, early in the year, and by the time the fruit appears all traces will have been washed away, or what little remains will be in such minute quantities that it can be eaten without harm resulting.

The paper concludes with an account of fumigation with hydrocyanic acid, as practised in America.

SACHAROV (N.). **Біологія восклицательной совки и озимой по наблюденіямъ въ Тульской и Тверской губ. въ 1909-1910 годахъ.** [The biology of *Feltia* (*Agrotis*) *exclamationis*, L., and of *Euxoa* (*Agrotis*) *segetum*, Schiff., according to observations in the Govts. of Tula and Tver in 1909-1910.]—*Published by the Entom. Sta. of the Astrachan Soc. of Fruit-growing, Gardening, Market-Gardening and Field Cultivation, Astrachan,* 1913, pp. 17, 1 fig.

These observations on *Euxoa segetum* and *Feltia exclamationis* were conducted in the district of Novotorzhok of the government of Tver and in the district of Bogoroditzk of the government of Tula. In Novotorzhok the moths of both species were on the wing from 3rd July to 2nd August, the maximum being reached about the middle of July. In the government of Tula the flying of the moths started, notwithstanding the cold weather prevailing, on 4th June, reached its maximum on 2nd July and decreased after 28th July. The numbers of *E. segetum* decreased in the first half of July and the females contained fewer eggs; while *F. exclamationis* increased at this time, and the majority of females contained their full complement of eggs. Of the moths captured from 29th June to 7th July, 36 per cent. were *F. exclamationis* and 64

per cent. *E. segetum* ; while of the latter 41 per cent. were females, and of the former 36 per cent. In the second generation the proportion of *F. exclamationis* was only 15 per cent.

The principal weeds on fallow fields in the district in Tver, where they are not used for pasture, are :— *Polygonum convolvulus*, *Cirsium arvense*, *Sonchus arvensis*, *Atriplex tataricum*, *Rhinanthus cristagalli* and various species of *Plantago*. In the area in Tula the fallow land is used for pasture and the principal weeds are :—*Polygonum aviculare*, *Malva rotundifolia*, *Rhinanthus crista-galli*, *Artemisia campestris*, *Convolvulus arvensis*, *Linaria vulgaris* and various species of *Carduus*. In nature the moths oviposited on all weed grasses, except *R. crista-galli*, which is apparently avoided on account of its hairiness. Oviposition lasts from 18 to 34 days, *E. segetum* starting earlier than *F. exclamationis*. In Novotorzhok the development of the caterpillars lasted 63 days for *F. exclamationis* and 68 days for *E. segetum* ; while in Bogoroditzk the figures were 51 and 46 days respectively. There were two generations of the moths in the government of Tula, although the author is not in a position to say that this is permanently the case ; in the year of observation there was an exceptionally early spring, which accelerated the appearance of the wintering generation and the development of its descendants. Of the hibernating larvae obtained by the author only 8 per cent. produced moths ; of the remainder about 74 per cent. were killed by parasites and fungus diseases.

Very few parasites of the insects were obtained in Novotorzhok, where most of the caterpillars of the preceding autumn had perished from flacherie and muscardine ; this was also the case in 1909. The species recorded are two Ichneunionids, *Anomalon* sp., bred from a pupa of *F. exclamationis*, and *Paniscus gracilipes*, Gr., reared from caterpillars of both species in August ; and one species of fly, *Tachina larvarum*, L., reared from caterpillars of *F. exclamationis*.

In the government of Tula most of the caterpillars perished from parasites and only a small proportion from flacherie. The following figures are given :—ICHNEUMONIDAE : $12\frac{1}{2}$ per cent. of the caterpillars were infested by *Paniscus gracilipes*, $28\frac{1}{4}$ per cent. by *Henicospilus merdarius* and *Ambliteles vadatorius*, and $3\frac{1}{2}$ per cent. by *Exetastes agrotidis*, Kok., sp. nov. ; TACHINIDAE : 17 per cent. by *Gonia capitata* and *Cnephalia bucephala*, and $\frac{3}{4}$ per cent. by *Tachina larvarum ;* 12 per cent. by fungus diseases. *Exetastes agrotidis* has been identified by Kokujev as a new species, and the author gives a description and figures of the imago, larva and cocoon ; the larva develops inside the caterpillar of the host and leaves it for pupation, which takes place in earth. The parasite has two generations during the summer and is found constantly on flowers ; it parasitises also the caterpillars of *Chloridea dipsacea*, L.

The author mentions also another parasite which he reared from a caterpillar of *F. exclamationis* in the government of Saratov ; this being a Braconid, *Amicroplus* (*Macrocentrus*) *collaris*, sp. n., 50–60 larvae of which breed inside one caterpillar of the host ; the larvae pupate in the earth ; these parasites appeared on the 31st May. Pospielov reports them also from the government of Kiev.

Kulagin (N. M.). **Вредныя насѣкомыя и мѣры борьбы съ ними.** [Injurious insects and methods of fighting them.]—Second revised and considerably enlarged edition. *Moscow*, 1913, 783 pp.

Those who have to deal with Russian Economic Entomology will be grateful to the author for providing a mass of detailed and well arranged information on the subject and an excellent guide to the insect pests of crops over a vast extent of country, embracing wide variations of climate and local conditions, and in which the unit of area of individual crops is more easily reckoned by square miles than by acres, while the damage done by certain pests in a single season would be equivalent to the virtual wiping out of that crop in several English counties. A series of lectures, delivered by the author at the Moscow Agricultural Institute, form the basis of the book and in accordance with the programme of these lectures the author has more or less confined his attention to the pests of field crops, orchards and gardens, dealing only with the more important forest pests. In this, the second edition, the number of insects dealt with has been very greatly increased and the information regarding each enlarged, and brought up to date. As the book deals with the subject from the Russian point of view and is intended for Russians, the author has chiefly relied on Russian entomological literature, local conditions being, as he insists, the principal factor to be considered in fighting an insect pest. A number of remedies are dealt with, the real efficaciousness of which is still not proven, but which may nevertheless ultimately be of value. The author has advisedly made use of the best known scientific names, despite the fact that many of these are no longer held to be correct, on the ground that by so doing he has avoided the confusion which would inevitably have arisen had he endeavoured to incorporate the recent frequent and rapid changes in nomenclature.

The subject matter is arranged under the insects in their systematic order, descriptions being given of the various groups, families and genera, while the individual species are dealt with most comprehensively. The last part of the book is devoted to a general review of the scientific methods of fighting insect pests. Chief amongst the latter the author puts the organisation of Entomological Stations, and he quotes from the report of a special committee, which, under his chairmanship, investigated the question of the objects and duties of such Stations, and reported thereon to the Moscow Zemstvo in 1912. The authors of this report dwell upon the intimate dependence of various pests upon the geographical position of a locality, its meterological conditions, and the methods of agricultural economy and field cultivation prevailing therein; it is also pointed out that these conditions may be very different even in closely adjoining areas, so that an exhaustive study of these factors is necessary, and the results obtained in the laboratory must be checked by observations under natural conditions. The Stations must also educate the population by means of lectures and popular pamphlets, and by sending collections of insects to elementary schools, agricultural societies, etc.; they should further warn the public as to the possibility of an outbreak of various pests. Among other scientific methods of fighting injurious insects are mentioned crop rotation and the cultivation of the soil at

times and in a manner best suited for this purpose. The value of preventive methods is also insisted upon, such as precautions when buying seeds and seedlings, careful attention to the bark of trees in orchards and gardens underneath which many insects pass their winter, etc., and assistance on the part of man to different enemies of insects, such as birds, parasites, fungus diseases, etc. The author deals at some length with the question of the useful services rendered by birds in destroying insects and quotes a report on some investigations of Pomeranzev and Shevirëv, from which it appears that in the stomachs of various birds are found mostly insects of the order Coleoptera, next in order being Hemiptera, Hymenoptera (ants), Orthoptera, Diptera and Lepidoptera ; Neuroptera are seldom found. The author further discusses the work done on this subject by Baron von Berlepsch in Germany and suggests the necessity of regulations calculated to protect useful birds. In his opinion birds are not able to control an insect pest after it has become abnormally abundant, as their capacity for destruction is limited, but they may sometimes prevent such outbreaks. The protection of birds can be accomplished by means of special regulations as to shooting and trapping, by the control of industries connected with the preparation of birds' skins, and by educating the public in this direction.

The indices are particularly useful and consist of an index of generic names, an index of Russian popular names (450) and a general index with special reference to insecticides. When it is considered that no less than 278 insect pests are dealt with and that the information given in each case is practically exhaustive from the author's standpoint, it is a matter for regret that the language in which it is written prevents a most useful and practical book from being generally accessible to Economic Entomologists throughout the world.

SHEVIRËV (I. J.). **Регулированіе пола потомства самками наѣздниковъ.** [The Regulation of the Sex of their Offspring by Female Ichneumonidae.]—*Bulletin du Laboratoire Biologique de St. Petersbourg*, iii, no. 2. 1913, pp. 24-30.

The author records the observations made by him in the Entomological Laboratory of the Forestry Department on parasitic insects hatched from pupae ; these had first been conducted on *Pimpla instigator*, F., but were repeated and confirmed also on *Pimpla examinator* F., *P. brassicariae*, Poda, and *P. capulifera*, Kriech. Each *Pimpla* was kept in a special cage, made of cardboard and muslin and fed every alternate day, the food consisting of a smear of honey on a glass with a drop of water ; some insects were fecundated, others were kept virgin during their whole life, which lasted from two to three months. The author has noticed that all these species of *Pimpla* belong to a group called by him " uninuptae," i.e. they are fecundated only once in their life, refusing afterwards to copulate with any other male. The opposite group, " multinuptae," for instance *Theronia*, consists of species, which are fecundated repeatedly and by many males. The fecundated, as well as the unfecundated females oviposited willingly on pupae which had been placed in an artificial cocoon, made from muslin or linen. Some of the pupae offered for oviposition were of large size, such as those of *Sphinx*, *Saturnia*, *Gastropacha pini*,

*Smerinthus populi*, etc., while other were small, such as *Pieris*, *Bupalus*, *Panolis*, *Vanessa levana*, etc. The author gives a few instances of his observations on fecundated females from which he concludes that, in depositing their eggs in various pupae, the females regulate, in the great majority of cases, the sex of their descendants, according to the size of the pupae. In large pupae, containing a plentiful supply of food, are deposited eggs from which females hatch out, while small pupae contain only male eggs. If only large pupae are offered, males can be quite excluded from the descendants of a given female, and when only small pupae were supplied the percentage of hatched males was greater than that of the females. These observations have been confirmed with pupae infested by parasites under natural conditions. The author had about 2000 cocoons of *Lophyrus*, the cocoons of the females of which are nearly twice as large as those of the males. He kept the cocoons of the males and of the females separately and obtained parasites from 970 cocoons ; the parasites belonged to two species :—(1) *Exenterus* sp., of which 870 were bred ; from the large cocoons 21 per cent. were males and 79 per cent. females, and from the small cocoons 53 per cent. were males and 47 per cent. females ; (2) *Campoplex* sp., of which 100 were obtained, 30 per cent males and 70 per cent. females out of the large cocoons, and 74 per cent. males and 26 per cent. females out of the small cocoons.

As to virgin females, his observations have confirmed previous statements that such females are able to lay eggs and to produce descendants, the latter being only males, and he is of opinion that this rule applies to the whole family of ICHNEUMONIDAE in its wide sense. The size of the males produced varied in accordance with the size of the pupae in which they developed. Giant males were obtained from the large pupae of *Sphinx ligustri*, dwarfs from the small pupae of *Bupalus piniarius*, and males of medium size from the pupae of *Pieris brassicae*.

BORDAGE (E.). **Notes Biologiques recueillies à l'Ile de la Réunion.** [Biological Notes from Réunion.]—*Bull. Scient. de la France et de la Belgique, Paris,* xlvii, no. 4, 5th Jan. 1914, pp. 377-412, 14 figs.

The author has given an account of some of the more interesting features in the life-history and habits of certain insects found on Réunion ; many cases mentioned are of economic interest. In the Mascarene Islands sugar-cane is attacked by various Lepidoptera—*Diatraea striatalis*, Snell., *Sesamia inferens*, Walk. (*albiciliata*, Snell.), *Grapholitha schistaceana*, Snell., etc.—which bore into the stem of the plants. Their principal enemies are three Ichneumonids : *Ophion mauritii*, *O. antankarus* and *Paniscus melanocotis*, which also occur in Madagascar and Mauritius, where they are of great service to sugar-planters. Referring to the introduction of *Sirex gigas* into Réunion, the author draws attention to the great strength of the mandibles of this insect ; he believes it to have been transported from Europe in wood into which it had eaten its way : *Sirex gigas* has been known to gnaw through a pile of cardboard, and even through the lead of cartridges. Further cases of parasitism on insects harmful to cultivated plants are recorded ; in Réunion the coffee plants have their leaves mined by two micro-

lepidopterous insects, *Leucoptera* (*Cemiostoma*) *coffeella** and *Gracilaria coffeifoliella*, both of which are attacked by a Chalcid (*Eulophus borbonicus*, Gd.) and a Braconid (*Apanteles bordagei*, Gd.); *L. coffeella* is kept well in check by these parasites in Réunion, whereas in the Antilles serious damage is done by this moth. Three species of ACRIDIIDAE are found in Réunion. *Locusta migratoria*, *Acridium septemfasciatum* and *A. rubellum*, and in certain years these insects have caused serious damage to sugar-canes. An attempt was made to combat *A. septemfasciatum*, which was particularly prevalent in 1901, by introducing the fungus disease due to *Mucor exitiosus*, Mass. In the laboratory the result was very satisfactory, as it was there possible to maintain the temperature and moisture conditions most favourable to the propagation of the fungus; but in the field the same success was not met with, possibly owing to the coldness and dryness of the season. In 1765 Poivre introduced the mynah of the Philippines (*Acridotheres tristis*, Vieill.) into Réunion; this bird which used to prey upon crickets and grasshoppers is now of little use in controlling these insects, as it has become practically frugivorous in habit.

The Coccid *Orthezia insignis* is plentiful in Réunion. At first it was recorded as feeding mainly upon the noxious plant *Lantana camara* (Corbeille d'or), thereby being beneficial; but lately it has taken to feeding on cultivated plants and must be regarded as a pest. An account of this insect in other parts of the world and its food-plants is given. Giard suggested that the waxy secretion deposited by this insect might be utilised in the making of wax candles, as it is used in China for the preparation of pe-la wax. Another Coccid pest is *Ceroplastes vinsoni* which attacks the tea plant, mango trees, guavas, bibassier (*Eriobotrya japonica*), *Agauria pyrifolia*, *Quivisia heterophylla*, and *Aphloia theaeformis*.

Two scale-insects are harmful to the coffee plant, namely *Saissetia coffeae* and *S. nigra*, and also *Pseudococcus adonidum*, which attacks not only the young shoots, but also the roots; this species is devoured by a Coccinellid, *Scymnus rotundatus*, Motsch. Cocoa trees are attacked by the Coccid *Aspidiotus destructor*, Sign.; although no steps are taken to combat this insect, it remains well under control, probably owing to the fact that it is parasitised by certain Chalcids. Vanilla plantations are attacked by *Cerataphis lataniae*, Licht. A species of Psyllid (*Trioza litseae*, Gd.) has been found on plants of the laurel family, and also on Orchids whose fruit it destroys; it is possible that at any time it may attack the vanilla; to avoid this possibility the author suggests cutting down the laurels that at present form its staple food.

CAESAR (L.). **The San José and Oyster-Shell Scales.**—*Ontario Dept. Agric., Toronto, Ont., Bull.* 219, Jan. 1914. 30 pp., 16 figs.

The original home of the San José scale is China. It was introduced into San José, California, about 1870. By 1893 or 1894 it had spread all over most of the United States and had even been brought into Ontario. It was doubtless brought in on nursery stock, and the insect can live and thrive at least wherever peach trees can be grown,

* See this *Review*, Ser. A, i, p. 105, note.

and therefore may be expected to spread through all peach districts, but probably not further north than its present northern limit. All orchard trees, except sour cherries and usually Kieffer pears, are attacked. Currants, rose bushes, some ornamental and forest trees and shrubs are also severely affected. The insect may be easily identified, since it usually causes small, circular reddish spots on the fruit and a purplish discoloration of the tissues beneath the bark where it feeds. The adult female is almost circular, nearly flat, about $\frac{1}{16}$-inch in diameter, grayish to ashy brown in colour, with usually a small yellowish area in the centre. The immature black stage is found at all seasons. The first brood of young scales begins to appear about 20th June and there are probably three, or nearly three, full broods a year in Ontario. A single over-wintering female may produce 1,000,000 offspring. By far the most important of all the various means of distribution of the San José scale has been infested nursery stock. Once in a locality, it spreads from tree to tree by the active larvae crawling upon various kinds of insects or birds that alight upon or frequent infested trees. Winds and vehicles may also assist in their distribution. There is apparently little danger of establishing the pest in a new centre by marketing infested apples, but as a precaution the sale of such fruit is forbidden by law. The scale will attack any part of the tree or plant above ground and the bark may become thickly encrusted with it. The insects suck the juice of the plant and probably also secrete a poison which increases the injury. Small trees may be killed in a couple of years ; larger trees usually take longer, and an old apple tree may survive for six years or more. Infested fruit is usually dwarfed. Among the natural enemies of this insect in Ontario are *Microweisea* (*Pentilia*) *misella*, *Chilocorus bivulnerus*, *Aphelinus mytilaspidis* and *A. fuscipennis*, a red mite and a fungus disease ; but they are of little importance in controlling the pest. The insect can be readily controlled by a single thorough spraying once a year, before the buds have burst in spring ; badly infested trees require two applications the first year, one in autumn, the other in spring. The spraying must be done thoroughly so that every part of the tree above the ground is covered. The lime-sulphur wash is to-day recognised all over North America as much the safest, best and cheapest spray mixture. The most desirable strength is about 1·035 specific gravity. As a supplement to lime-sulphur spraying, kerosene or crude petroleum emulsion may be used. Spraying should not be done when the trees are wet, nor when it is likely to rain. Neither should it be done when the temperature is below freezing point. The lime-sulphur should always be tested with a hydrometer. It is usually possible to control the scale in one's own orchard independently of neighbours.

The oyster-shell scale (*Lepidosaphes ulmi*, L.), believed to be an imported insect, attacks apples chiefly, and also pears, plums, cherries, gooseberries, currants and ornamental plants. This scale confines itself almost entirely to the trunk and branches. The injury is due to the plant juices being sucked out by the insects. In thrifty orchards the insect is seldom abundant, since it seems to exhibit a preference for neglected and weakened trees. Attacked trees usually live for many years. The female scale is about one-eighth of an inch long and scarcely one-third of this in width, this shape

distinguishing it from the San José scale. The oyster-shell scale passes the winter in the egg stage, the eggs hatching about 1st June. There is only one brood a year in Ontario. The chief means of distribution of this insect is the shipment of infested nursery stock, as well as the carrying of the larvae by birds and other animals. Among the natural enemies of this pest are lady-bird beetles (adults and larvae), a few mites and a fungus disease. The lime-sulphur wash, properly applied, will readily control this scale. Two sprayings should be given for the best results, the first at the strength of 1·030 and the second at 1·009 specific gravity. The spray not only destroys the oyster-shell scale, but many other insects. Bordeaux mixture may be used in place of the lime-sulphur, just before the blossoms burst. Old trees should be pruned before spraying and the rough bark scraped off.

Gough (L. H.) & Storey (G.). **Methods for the Destruction of the Pink Boll Worm in Cotton Seed.**—*Ministry Agric., Egypt, Cairo,* 1914, 21 pp.

The history of the pink boll worm in Egypt has been a short, but disastrous one. The moth (*Gelechia gossypiella,* Saund.) was introduced from abroad not many years ago. The first specimens recorded by the Entomological Section were bred on 29th November 1911, and in 1913 *Gelechia* larvae caused more damage than all the other cotton pests put together. In 1912 experiments to destroy the caterpillars by fumigation were all carried out on seeds in sacks, but the method was recognised as very imperfect. In 1913 other experiments were made and the methods may be classed into mechanical and chemical. The mechanical methods included hot water treatment, cold air treatment, hot air treatment, and enclosure in a vacuum. In the experiments on the first method, small equal quantities of seeds were tied up in muslin bags and immersed in beakers of hot water for one minute, the temperature being recorded by a thermometer in the water and another with its bulb within the seeds. From experiments it is shown that the fatal temperature for *Gelechia* larvae must lie very close to 50° C., while the fatal temperature for cotton seed is very near 75°. This is not a suitable method for employment on a large scale on account of the necessity for the immediate sowing or immediate drying of the tested seed. An experiment was made with temperatures under 0°, and –6° C. was found to have no effect on the larvae. Experiments on the effect of temperatures over 60° C. gave positive results. In the first series a hot water bath was constructed and traversed from end to end by a square tunnel which sloped gently upwards. Two rollers outside the ends of the tunnel carried an endless band of cloth, on which the seeds to be tested were placed and thus carried through the tunnel. It was found that exposure to a temperature between 75° and 94° killed all the larvae without affecting germination. The results might possibly have been different if the seed had been resting on metal instead of cloth, and caution is urged if this method of hot air treatment is used. In a second series of experiments, the seed was lying on a sheet of asbestos, and here four minutes at 80° appear to have been perfectly effective in killing the caterpillars, without unduly affecting the seed. Any hot-air machine must be ted. To test the possibility of killing *Gelechia* larvae by subjecting

them to reduced pressure some of the insects were introduced into the vacuum at the top of a mercury barometer, but half an hour under these conditions had no effect.

The chemical methods tried were chiefly based on the poisonous effects of various gases. Carbon bisulphide vaporised at the rate of 1 c.c. of the fluid to each litre of the seed gave perfect results at the end of half an hour. Three methods were used, the fluid carbon bisulphide being sprayed on the cotton seed whilst passing into the container; the carbon bisulphide introduced into the container before filling with seed; and the carbon bisulphide vapour circulated through an evaporating chamber into the container through an air-pump and back through the evaporating chamber to the container. The last method is the best, but the last two both gave perfect results. A machine to utilise the last method could be constructed on the following general lines:—Five or six vats to contain the seeds to be treated form the "battery." These vats must be constructed so that they can be hermetically closed when charged. Arrangements must be made to pump the gases in below, and a diffuser would be required at the top to draw off the gases. The circulating system would consist of an exhaust main and a blast main connected by a rotary or turbine air-pump. From these mains, branches would be given off to each of the vats. This would enable a constant current of air or gas to be run through any or all of the vats, since each branch would be arranged so that it could be cut off from the main by a tap. In practice one vat would be filling with seed, the following filling with gas, the next two would be standing to let the gas act, the fifth would be discharging gas and the sixth discharging seed. By this method the charges of carbon bisulphide required when the machine is going will be considerably reduced, and the advantage of having two vats "standing" full of gas is that the period of action for the gas is thereby doubled. Carbon bisulphide vapour has no effect on the germination of cotton seed. As the time proposed for action of the gas is not more than one hour, no fear need be entertained of deterioration of the seed. Motor spirit was tried and although used in larger quantities was less effective than carbon bisulphide. Ammonia was unsatisfactory, especially as germination appeared to suffer. Hydrocyanic acid gas, even in very small doses, kills a very high percentage of larvae, but requires a longer time to act than carbon bisulphide. The expense for chemicals however, would be less. The use of sulphur dioxide produced by a "Clayton machine" gave distinctly promising results, but they cannot be compared with the results of other experiments, owing to the impossibility of using the machine for small scale trials. Tobacco smoke and vaporised Cyllin were ineffective, although Cyllin in solutions of 1 : 1,000 were all that could be desired, if the seed containing the larvae were soaked for a period of twenty-four hours. "Salvatorine" in dilution of 1 : 1,000 was effective in killing the caterpillars, but affected germination also. It has been found that no treatment is possible when the seed is in sacks, and in order that such treatments as are mentioned above may be effective, rigorous measures should be adopted to destroy all cotton bolls left on the cotton sticks after the last picking.

VASSILIEV (I. V.). **Шелкопряды сосновый и кедровый, ихъ образъ жизни, вредная дѣятельность и способы борьбы съ ними.** [*Dendrolimus pini*, L., and *Dendrolimus segregatus*, Butl., their life-history, injurious activities and methods of fighting them.] **Труды Бюро по Энтомологіи Ученаго Комитета Главнаго Управленія З. и З.** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture*,] *St. Petersburg*, v, no. 7, 1913, 99 pp., 34 figs., 2 col. plates. (Second, enlarged edition).

This is an enlarged edition of the author's report on *Dendrolimus pini* and *D. segregatus*, after investigating in 1898 and 1899 the devastation caused by the latter in the forests of the government of Irkutsk (Siberia). After describing fully all the stages of these two moths, the author proceeds to deal with the life-history of *D. pini*. Hot dry weather accelerates the development of the earlier stages and the appearance of the imago, while a cold, wet summer has an opposite effect. In most parts of Russia the moths start flying from the end of June to the beginning of July, and attain their maximum during the middle of July. A full account is given of the oviposition, development, hibernation, pupation, etc., of both *D. pini* and *D. segregatus*. The flying of the latter species in the forests of the southern part of the government of Irkutsk took place in 1899 at the end of June and the beginning of July, and after the 27th July no live moths were to be found, the earth everywhere in the forests being covered by their dead bodies. These insects were specially abundant in woods consisting of *Pinus cembra* and in the "taiga,"* while they were totally absent in pure birch-woods and in mixed woods of pine, larch and birch trees; in pure pine woods they were found only where the latter joined the affected areas. In 1898 there were very few moths in the forests of the government and the author did not find any of their eggs, but there were plenty of caterpillars; this fact led him to assume that the development of the insect takes two years, that the year 1898 was not a "flying" year, and that the year 1899 would witness an outbreak of the moths and extensive oviposition. This assumption proved quite correct and early in July 1899 there was scarcely a small plant which did not bear eggs of *D. segregatus*. The trees most affected were *Pinus cembra*, the silver fir (*Abies pectinata*) and the spruce (*Picea excelsa*); less frequently the eggs were found on needles of pines and larches, while in exceptional cases only were they found on leaves of birch, aspen, service trees, spiraea, red and black bilberry and various grasses. It was observed that the insects did not oviposit on plants affording a limited supply of food; eggs were seldom found on freshly stripped or withered plants, in which respect this species differs from *D. pini*, the females of which oviposit indiscriminately on plants in any state. Most of the eggs were laid on the needles and only in a few exceptional cases were they found on the branches or trunks. The total number of eggs deposited by one female is on the average about 200, the maximum number being 315. The hatching of the caterpillars proceeded from the middle of July till the middle

* ["Taiga" is a Siberian word signifying a dense, more or less impenetrable forest, often of a swampy character.—ED.]

of August, and most of them hibernated before the second moult, as the temperature of the nights and early mornings fell sometimes to freezing point even in the first half of August. The caterpillars appeared again on the trees in the first half of the next May, but just after their appearance they take little food. The feeding increases gradually, and the maximum damage to the trees takes place in June and July, when a caterpillar may devour in a few minutes a whole fir needle; during this time the caterpillars more than double their size. In August the feeding decreases again, although the caterpillars still remain on the trees, passing to the second wintering in September. Hibernation takes place in both cases under moss in the "taiga." After the second winter the larvae appear again in April, feeding till early in June, when they pupate, producing moths in the same month.

The author goes on to deal with the importance of *D. pini* in the economy of forests, describing the nature and consequences of the damage done, the selection of plantations by the females for oviposition, the methods of migration of the caterpillars, and the geographical distribution of the pests. It often happens that numbers of the larvae perish through not being able to find food in the woods laid bare by the preceding generations; moreover, the denudation of the crowns of the trees also caused the pupae to perish, owing to the excessive heat of the sun's rays, coupled with the loss of moisture. The bare crowns favour also the activities of various parasites, and the number of caterpillars infested by them in such trees is much larger than in trees with needles on them. While *D. pini* prefers pine trees, which provide its principal food, *D. segregatus* avoids these trees, and the author states that he has even seen single pines or groups of pines unattacked or only slightly damaged, while all the trees round them (firs, cedars, larches) were entirely stripped by the larvae. In the government of Irkutsk the principal food of these insects is provided by firs, Siberian firs and cedars, while in some parts of the government of Ufa *D. segregatus* damages principally larch trees. The caterpillars attack mostly old cedar woods or "taiga" forests (100–150 years old) which form the greater part of the forests of Irkutsk; young plantations, up to 10 years are seldom attacked, unless they are situated in the neighbourhood of an infected area; otherwise they are only attacked after the older trees are laid bare. While it is admitted that the young larvae of *D. segregatus* may possibly be distributed by the wind, the older caterpillars are able to migrate only for short distances. The geographical distribution of *D. segregatus* includes the whole of North Asia, from the Ural Mountains to Japan, the north-western limit of its distribution being Syrostan, in the Southern Ural. The author gives a short history of the devastation caused by this pest since 1892, when attention was first drawn to the enormous damage caused by it in the "taiga" of Eastern Siberia; the local population had known the larvae for 15–20 years previously. Most of the attack was concentrated in two districts of the government of Irkutsk and it is calculated that the damage there amounted to more than £55,000, several hundred thousand dessiatines (2·7 acres) of forests being destroyed or injured. In these districts may be seen enormous areas of dead and dying forests of cedars, firs and larches. Young trees, of up to 20–30 years, die in the same year; the older cedars and firs, when damaged by *D. segregatus*, are usually subjected afterwards to attacks

of such beetles as *Monochamus sartor*, *M. pistor*, *M. saltuarius*, *Ips typographus* (firs) and *I. sexdentatus* (cedars). To this must be added the injury caused by the decrease in the fir and nut trades of the locality, which resulted from the drying out of the "taiga." In 1902–3 an outbreak of *D. segregatus* occurred on the European side of the Southern Ural, in the district of Zlatoust of the government of Ufa and in the adjoining district of Troitzk of the government of Orenburg, where some hundred dessiatınes of deciduous trees were devastated.

With regard to the natural enemies of *D. pini*, the author says that amongst mammals the most important are bats. Among birds, various titmice and tree-creepers eat the eggs; the caterpillars are principally devoured by cuckoos, as well as by crows, rooks, magpies, jackdaws, great spotted woodpeckers and rollers. The large caterpillars and moths are also destroyed by the grey-backed shrike (*Lanius excubitor*), which impales them on the needles of young pines. The pupae of *D. pini* are eaten by *Parus ater* and *P. cristatus*, also by crows, jackdaws and rollers. The moths are principally attacked by owls, goatsuckers and the red-footed kestrel (*Erythropus vespertinus*). But the most important enemies are insects, amongst which the following predators are mentioned:—predaceous beetles and their larvae (chiefly CARABIDAE), ants, Pentatomid bugs and Asilid flies. The caterpillars and pupae of *D. pini* are subject also to fungus diseases, and especially those caterpillars which winter in wet soil; chief amongst the fungi the author puts *Cordiceps militaris*, but there are also cases reported of diseases caused by *Empusa* and *Botrytis*. The bacterial diseases have not been fully studied, but the author is of opinion that flacherie probably exists.

Considerable space is devoted to parasites of *D. pini*, and a list is given containing 13 species of Diptera, *Tachina winnertzi*, B.B., being recorded for the first time; there is also a list of parasites of the families ICHNEUMONIDAE, BRACONIDAE, CHALCIDIDAE and PROCTOTRUPIDAE (p. 55). The author remarks that this list cannot be considered to be final, and it is probable that some of the parasites may prove to be hyperparasites, as has already been proved by him in the case of *Theronia flavicans* and *Monodontomerus virens*, while others, such as *Ischnocerus marchicus* and *Rhogas esenbeckii*, may have to be excluded. The egg parasites *Ooencyrtus atomon* and *Telenomus umbripennis* were first found by him in 1904. The author deals separately with each parasite, and gives in every case a list of their other hosts. He mentions that the Tachinid fly, Phryxe (*Blepharidea*) *vulgaris*, Fall. is ovi-viviparous, a female laying up to 5,000 larvae, each included in a transparent cover, which sticks to the skin of the caterpillar; *Sarcophaga albiceps*, Mg., and *S. affinis*, Fall., are both viviparous and monophagous. With regard to *Trichogramma* (*Oophthora*) *semblidis*, Aur., the author is satisfied, by his latest experiments in 1912–13, that this species is not synonymous with *T. carpocapsae*, Ashm., and he points out the difference in the habitat of the two species, remarking also that *T. carpocapsae* does not infest the eggs of *D. pini*, breeding in nature principally in the eggs of *Cydia pomonella*, and also in those of *Phlyctaenodes sticticalis* and *Euproctis chrysorrhoea*. His experiments and observations have satisfied him that *Telenomus phalaenarum*, Nels., never infests the eggs of *D. pini*.

With regard to the enemies of *Dendrolimus segregatus* in the government of Irkutsk, they consist principally of certain birds and parasitic insects. The large caterpillars are devoured by a jay (*Garrulus infaustus*), while the smaller caterpillars and the eggs are destroyed by *Sitta uralensis* and *Poecile baicalensis* and similar species; both these birds, in company with woodpeckers and the nut-cracker (*Nucifraga cariocatactes*), destroy also the pupae. The most active parasites, according to his observations in 1899, were:—*Panzeria rudis*, Fall., and *Masicera cespitum*, Macq., which destroyed in the Shadarınsk "taiga" more than 30 per cent. of the caterpillars; while the egg-parasite, *Telenomus gracilis*, Mayr, also proved very useful, more than half of the eggs collected by the author being infested; in the young caterpillars he found parasites of the genus *Rhogas*. Besides parasites and birds, the insects perished also in great numbers from a bacterial disease, which the author is inclined to recognise as flacherie. As preventive remedies the author suggests mixed plantations, consisting of deciduous and coniferous trees, oak, birch, beech and aspen being recommended as suitable. Small woods, of trees of various ages, even when consisting only of pines, are also less damaged by the insects and can be better supervised; care must also be taken to cultivate strong healthy trees, which will be able to withstand the damage. With regard to destructive remedies he recommends bait-belts of tanglefoot; isolation avenues, to divide the attacked parts of the wood from the rest; poisoning of the caterpillars by means of Schweinfurt green, in a proportion of about 2 lb. of green and 4 lb. of freshly slacked lime in about 110 gallons of water. The handpicking of wintering caterpillars has proved to have very little effect. The destruction of the eggs of *D. pini* can be recommended only as a secondary remedy, and it is only admissible when there are no signs of the eggs being infested by parasites. The eggs can best be destroyed by crushing or smearing them over with naphtha or by handpicking and this must be done quickly at the time when the flying of the moths is nearing its end. The collection by hand of the moths, which usually sit motionless during the day, not very high above the earth, is also recommended, especially before oviposition has started; the collection of the pupae is only recommended when the percentage of pupae infected by parasites is small.

With regard to *Dendrolimus segregatus*, such remedies as bait-belts do not appear practicable in the forests of Siberia. But the fighting of the pest by means of its parasites may prove very successful, principally the parasites of the eggs, such as *Telenomus gracilis* and *T. umbripennis*. These must be artificially bred and supplied to localities threatened by *D. segregatus*.

DEVEZ (G.). **La Fourmi-Manioc** (*Oecodoma cephalotes*).—*L'Agronomie Coloniale, Paris*, i. no. 5., Nov. 1913, pp. 129-135; i, no. 6, 31st Dec. 1913, pp. 164-174; i, no. 7, 31st Jan. 1914, pp. 13-18; i, no. 8, 28th Feb. 1914, pp. 42-51, 1 pl.

Opening with a few paragraphs on the general agricultural conditions in French Guiana, the author draws attention to the fact that many people have given up agricultural work, and this he believes to be due to the many discouragements met with in agriculture; for example,

in one night the most beautiful field, garden or fruit trees may be devastated by a band of leaf-cutting ants, known in the colony under the name of "fourmi-manioc," the greatest enemy to agriculture in Guiana. When on an expedition the ants form two groups; one group climbs the tree and bites off the whole leaf or parts of it, while the other group waits at the foot of the tree and gathers the leaves, which they carry to the nest. Numerous remedies have been tried against these insects without much success, such as the introduction into their nests of boiling oil, chloroform, corrosive sublimate, etc., and the Clayton system of forcing sulphurous fumes into the nest has not proved effective. Carbon bisulphide however has given excellent results, but apart from its dangerous qualities, it has the drawback of being expensive, as large quantities have to be used.

As a result of his experiments the author was led to believe that sulphurous anhydride would be still more useful. This substance when liquified possesses a considerable force of expansion, which, together with its great density, ought to allow it to penetrate to the deepest galleries. It is also very soluble in water and diffusible, and is not poisonous in small quantities, since the State authorises its use in wine-making to the extent of 350 milligrams per litre. The air cannot be breathed when it contains 1·5 per cent. of this gas. Pure liquefied sulphurous anhydride is prepared by two companies in Paris—La Compagnie Raoul Pictet, and Le Laboratoire des Industries Alimentaires. In Guiana this substance may be obtained for 0·85 francs (about 8d.) per kilo. (2·2 lb.), and is sent in copper or steel drums containing 25, 50 or 100 kilos. These drums are stamped at 30 atmospheres and have a tap. This tap is prolonged to the interior so as to receive a bent tube forming a siphon, so arranged that according to the position in which the drum is placed the anhydride can be obtained either as a gas or a liquid. Having obtained one of these drums, it is placed near the nest about to be destroyed, and a tube 3 metres long and 1 centimetre in diameter is attached to it, by means of a union. This tube is flexible, being made of bronze and asbestos, and surrounded by a metal twist of bronze to make it stronger. It ends in a stiff copper spike about 75 centimetres long, pierced in the last ten centimetres with about a dozen holes to allow the gas to escape. The outside of the nest is cleared to expose all the openings and it is generally necessary to remove the superficial layer of earth. The spike is then inserted into a hole only when it can be easily thrust in to a depth of 20 to 25 centimetres in any one direction, all the openings being thus treated. The spike should each time be slipped into a hole before opening the tap, the whole process taking about two hours. The necessary time for each hole varies, according to its importance in the nest, from two to five minutes. After the use of sulphurous anhydride it is not at all necessary to dig out the nest, but it should be visited a few days later to see whether any ants are still alive. This method has been employed with perfect success in the destruction of many large nests, and the treatment of a nest 15 metres in circumference and the top about 40 centimetres above the level of the soil, was witnessed by a meeting of the Chamber of Agriculture. The next day this nest was dug out and found to consist of seven tiers of nests, the lowest being at a depth of 1·5 metres; all the ants were dead and discoloured, 4 kilos of sulphurous anhydride being used.

This substance has many advantages over carbon bisulphide, since it is not inflammable, can be used at all times of the year, water not being at all necessary, and has no ill effects on neighbouring plants. When done thoroughly, as described, the results are said to be perfect.

Headlee (T. J.) & Parker (J. B.). **The Hessian Fly.**—*Kansas State Agric. Expt. Stn., Manhattan, Bull.* 188, July 1913, pp. 87-138, 15 figs. [Recd. 28th March 1914.]

The Hessian Fly first appeared in Long Island in 1779 and has spread north, south and west, causing serious loss in most of the wheat-growing regions of the United States. Since its first appearance in Kansas the fly has alternately disappeared and reappeared, since unfavourable weather conditions or an undue abundance of natural enemies may almost eradicate it. The egg is deposited upon the upper surface of the leaf, generally on wheat, rye, and barley, though recent evidence shows that certain wild grasses, as *Agropyron smithii*, serve as well. The length of the egg stage varies from two to ten or more days. An individual bred in an insectary, in an average temperature of 67° F. and an average mean relative humidity of 67·2 per cent. required 60 days to pass through all its transformations, of which 26 days were occupied in the period from hatching to the formation of puparium. The length of the life of the adult fly, a tiny long-legged gnat, is usually limited to a few days. The number of broods in Kansas varies with the climatic conditions. In 1908, the summer of which was very wet, there appear to have been two main broods and three supplemental broods. The main spring brood emerged during March and April; a supplementary spring brood emerged between 7th May and 1st June; a midsummer brood emerged between harvest and wheat sowing on the volunteer wheat; and the main autumn brood of adult flies emerged between 22nd September and 28th October. None of these produced progeny which reached the adult stage before winter. From the 15th to 30th October, a supplemental autumn brood emerged. Normally the midsummer brood might be almost entirely suppressed and no supplemental autumn brood developed. Temperature and moisture probably exert the largest influence on the Hessian fly. The low temperature of winter prolongs the life-cycle of the fly from 30 to 60 days to 6 months. Gossard and Houser showed that eggs after being subjected to a very severe frost in the field are not injured. In a moist atmosphere eggs withstood 107·6°F. easily for three days. Drought is dangerous to the fly and plenty of atmospheric moisture is favourable to it.

Osborn records for America six species of insects parasitic on the Hessian fly, namely, *Merisus destructor*, Say, *Homoporus subapterus*, Riley, *Pteromalus pallipes*, Forbes, *Eupelmus allyni*, French, *Entodon epigonus*, Walk., *Polygnotus hiemalis*, Forbes, and *Platygaster herricki*, Packard. *Tetrastichus productus*, Riley, and *T. carinatus*, Forbes, are parasites attacking the primary parasites of the fly. A new species of *Sciara* and a wire-worm were found to be predaceous enemies of the Hessian fly.

The autumn broods of maggots attack the wheat plants when they are young and the infested stalks are always stunted and frequently killed, though "tillers" may grow out from below the point of injury.

The spring broods of maggots attack the plants when much larger and better able to withstand injury. The attack of the fly may so weaken the stem that it will break at the point of injury and fall over before harvest.

Among measures of control often advocated is the pasturing of wheat, but this has been proved totally insufficient to control the fly. Rolling or brushing is also of little value and mowing does not seem promising in Kansas. No strain of wheat is yet known to be "fly proof." Garman's work in Kentucky shows that regular treatment of infested wheat with kerosene emulsion, Bordeaux mixture, lime and Paris green, and lime are of little value, while intermittent wheat culture and trap planting seem as useless. Destruction of fly in infested stubble is no doubt one of the best means of combating the pest, and may be accomplished by burning and ploughing under. Burning the stubble will destroy many of the puparia, but will not kill enough to keep the insect under control, those underground remaining untouched. The reason for ploughing lies in the idea that the infested stubble can be so deeply turned under and the ground so firmly packed that the flies emerging from the buried puparia will perish before reaching the surface of the soil. As a result of experiments it seems that where the ploughed stubble is buried beneath four or more inches of well pulverised soil, none of the flies can escape. Volunteer wheat is a menace to the succeeding crop and should not be allowed to grow. Late sowing is one of the most, if not the most, efficient of all measures for fly control. In different territories the date for safe sowing varies and should be ascertained by the entomologist, who should adopt as the safe-sowing date the average of dates on which the sowings of several years have been found absolutely free from fly. When an outbreak is anticipated a close watch should be kept on the fly emergence. The following steps are recommended when wheat is to be sown on a field infested the previous year. The disk should follow the reaper as quickly as possible, since it causes many of the weed seeds and most of the volunteer wheat to germinate and renders their destruction more certain and tends to bring about early emergence of the fly. The disked ground should be turned with a plough three or four weeks later and all rubbish buried at least four inches below the surface of the soil. If there is too much stubble to allow this the field should be burned over before being ploughed. By the use of harrows and packers the surface layer should be pulverised and packed down into a good seed-bed. The crop should not be sown until the safe-sowing date. Good seed and fertile soil will produce thrifty, rapidly growing plants, which will suffer much less injury from fly.

HEADLEE (T. J.) & MCCOLLOCH (J. W.). **The Chinch Bug** (*Blissus leucoptera*, **Say**).—*Kansas Agric. Expt. Stn., Manhattan, Bull.* 191, Nov. 1913, pp. 287-353, 7 pls., 11 figs. [Recd. 28th March 1914.]

The chinch bug has damaged Kansas crops to a greater extent than has any other injurious insect, and its history reaches back to before the settlers landed. Where corn and similar grains alone are grown the bug does small damage, because food is scarce in the early summer; and again, if wheat and other small grains alone are grown the harm

is small, for food is scarce in the latter part of the summer. This insect winters in bunch grass (*Andropogon scoparius*, Michx.), big blue stem (*A. furcatus*, Muhl.), false redtop (*Triplasis purpurea*, Walt.) and similar bunch-forming grasses. With the advent of warm weather the chinch bugs begin to emerge and leave their winter quarters for wheat and other small grains. Here the young are produced and reach maturity shortly after harvest time. With the failure of food in the small grain field the bugs migrate into adjacent fields of corn and sorghum. Here the young produced reach maturity in the autumn and establish winter quarters in the grass. Among the natural checks to the chinch bug, climate is probably the most important, temperature and moisture having been shown to exercise a great influence on the insect. The low temperatures of winter diminish the metabolism and lengthen the life of the bug. Specimens have been frozen in ice and yet recovered when released. Subjected to a constant temperature of 90°F. with a humid atmosphere the chinch bugs perish too quickly to effect reproduction. They thrive in dry seasons, but die in wet ones, 60 per cent. relative humidity being considered from experiments to be most favourable at a temperature of 70° F. Wet weather destroys the bugs directly and indirectly ; directly by burying the young and the eggs ; indirectly by weakening the bug and rendering it more susceptible of disease and by encouraging the growth of its fungous parasite, *Sporotrichum globuliferum*, Speg. This fungus and *Entomophthora* (*Empusa*) *aphidis*, Hoffman, stand pre-eminent among the enemies of the chinch bug. Much work has been done on these fungi, but all the really careful experiments agree with the author's results in showing that it is not possible by artificial distribution of the fungus to hasten materially the progress of the disease. On the whole these parasitic fungi are well distributed throughout that part of the United States subject to chinch bug outbreaks and cause great epidemics when temperature and moisture become favourable. An average temperature of 75° F. and a moisture close to saturation are most favourable to the activity of *S. globuliferum*. Among animals the chinch bug has few natural enemies. No internal parasite is known to attack it. The lady-birds, *Megilla maculata*, de G., *Coccinella sanguinea*, L., *Hippodamia convergens*, Guér., *H. glacialis*, F., *H. 13-punctata*, L., and two species of *Scymnus*, and *Chrysopa plorabunda*, Fitch, have been recorded as its foes. The flower bug (*Triphleps insidiosus*, Say) and *Milyas cinctus*, F., have been known to destroy the pest. Twice the false chinch bug (*Nysius angustatus*, Uhl.) has been observed feeding on the nymphs in the field ; and *Harpalus compar*, Lec., *Euarthrus sodalis*, Lec., and *Anisodactylus harpaloides*, Laf., have been seen feeding on bugs of all ages. A centipede and *Gryllus* sp. feed on adults ; the ant, *Solenopsis molesta*, Say, was observed carrying off chinch bug eggs, and *Monomorium minimum* carrying bugs of all sizes. Among birds the chief enemies are the quail, prairie chicken, red-winged blackbird, catbird, brown thrush, meadow-lark, house wren, tree swallow, horned lark and flicker. These are not efficient enemies. In a single year the chinch bug damages crops worth millions of dollars and may greatly reduce the wheat and absolutely destroy the corn and sorghums of the individual farmer. As the result of many tests it has been found that twice during the year the chinch bug may be destroyed—while passing from wheat and other small grains into adjacent fields of corn

and sorghum, and when just firmly established in winter quarters. As soon as the harvest is over the stubble should be mowed and burned off so as to leave no food for the insects, and the weeds and grass destroyed by thorough disking. This would compel them to leave the field in search of food, and in this passage they are caught by barriers. Two types of barriers are efficient—the dusty furrow for dry weather and the coal-tar or oil line for wet weather. The dusty furrow is a shallow ditch between the infested and non-infested fields, made with a plough, lister or trough drag, the sides and bottom of which have been reduced to a fine deep dust. The insects that collect in this furrow are then killed by flaming the sides and bottom of the barrier with a strong gasoline torch, the most efficient torch used being the "Locust Torch." The tar or oil-line barrier is a slender line of tar or oil poured along a smooth surface between the infested and non-infested fields. Prof. S. A. Forbes has found the Standard Oil Company's No. 8 road oil efficient and road oil No. 7 has been found to be a highly satisfactory substitute for the tar. To destroy the bugs that may get across, the infested plants are sprayed with kerosene emulsion, or, better still, with a solution of whale-oil soap or a decoction of "Black Leaf 40." The destruction of chinch bugs in winter quarters by the use of fire has proven, in the author's experience, the cheapest and most practicable method of solving the problem. Fire destroys the bugs directly or leaves them exposed to the weather by destroying their cover. The fire must be handled so as to make it burn close to the crown from which the stubble grows and the type of firing varies with the weather. November and December burnings have given the best results.

*Ceratitis hispanica* **in Algiers.**—*Bull. Off. Gouv. Gén. de l'Algérie, Paris,* xx, no. 1, 1st Jan. 1914, p. 3.

It is stated that in the department of Oran orange trees were much damaged during 1913 by the attacks of *Ceratitis hispanica,* which caused the fruit to drop or to die on the trees. Proprietors were recommended to place bottle-traps on the trees, a practice which was successful against the insect in other parts, and which is unattended by risks of destroying the fruit or rendering it harmful to man or animals.

**Contre les punaises de la Vigne.** [Combating the vine bug.]—*La Vie Agric. et Rurale, Paris,* iii, no. 6, 10th Jan. 1914, p. 167.

To combat the vine bug (*Nysius senecionis*) it is recommended by M. Picard of Montpellier to plant at intervals between the rows a species of false rocket (*Diplotaxis erucoides*), which attracts the insects; these plants are to be watered with boiling water or a corrosive liquid that will kill the insects.

**Vignobles et Vins.** [Vineyards and Wines.]—*Rev. Vitic., Paris,* xli, 29th Jan. 1914, pp. 131-139.

This commercial review of vine-growing in France during 1913 contains the following notes. In the Department of Aude the caterpillars of *Arctia caja* appeared in large numbers, but were destroyed by

a pathogenic fungus, *Empusa aulicea*, before doing much harm. Numerous pupae of *Polychrosis* and *Clysia* had been found in the winter. The first invasion was not severe, but as many growers had neglected lead arsenate treatment, the second generation of these Microlepidoptera was much larger in July. *Polychrosis* became very abundant and its third generation caused important injury. It is imperative that spraying with lead arsenate be practised against the first generation. *Oenophthira* in large numbers has caused much damage to the vineyards in the districts of Carcassonais, Minervois, and Etang de Marseillette, and the treatment applied formerly must be reverted to, and especially the use of arsenical insecticides. The winter slack season is being taken advantage of in some vineyards in Tunis for applying measures against the white scale, *Pseudococcus vitis*.

**Sur l'alimentation de la mésange bleue.** [On the food of the blue tit.] —*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xiii, no. 1, Jan. 1914, p. 16.

Some interesting observations were made by M. Richard near Neuchâtel on the feeding habits of blue tits. During October, when the leaves of the reeds had died down and only the long yellow stems with the heads remained standing, a blue tit was observed to fly down upon the reeds and break off the heads with its beak, in order to extract insect larvae, which it would devour. It is suggested that the tits which attack almonds are really in search of the larvae they contain and not eating the almonds themselves.

Engerbund (—). **A propos des nichoirs artificiels.** [Artificial nesting boxes.]—*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xiii, no. 1, Jan. 1914, pp. 16-17.

The author records some interesting facts in connection with the destruction of insect pests by birds, housed in artificial nesting boxes. The birds, which were tits, cleared an apple tree in his garden of woolly aphis ; red currant bushes were cleared of sawfly larvae, and kitchen garden plants of Pierids. Vines attacked by *Haltica*, were also visited and the pest practically disappeared.

Feytaud (J.). **L'Otiorhynque sillonné** (*Otiorrhynchus sulcatus*) **dans l'île d'Oléron.** [*Otiorrhynchus sulcatus* in the island of Oleron.] —*Bull. Soc. d'Etude et de Vulg. Zool. Agric., Bordeaux*, xiii, no. 1, Jan. 1914, pp. 7-14, 2 figs., 1 map.

The island of Oléron is, excepting Corsica, the largest of the French islands. The soil and climate are well adapted to vegetation and a large part of the island is under cultivation, vines being especially abundant. Insect pests have not in the past attracted much attention, as their ravages have not been serious, but at the present time alarm is being felt at the spread of certain species, notably of the weevil, *Otiorrhynchus sulcatus*, F. The appearance of this insect in the island seems to have been observed for the first time about four years ago, between Biroire and Chef-Maillère ; since then it has spread outwards in all directions. The adult damages the vines by attacking the shoots and arresting their development ; this is the most important injury

done, but, in addition, the larva attacks the roots. Other plants attacked are the peach, raspberry and strawberry. The insect appears at the end of May ; the eggs are laid during the summer on the earth ; the larva, which is fully developed in the autumn, hibernates until the following spring. The adult cannot fly, and consequently its spread is slow ; at present in Oléron the attack is restricted to about 100 acres in the commune of S. Pierre.

DEJOHET (E.). **La lutte contre les Cochenilles des Orangers.** [Orange Scale control.]—*Rev. Agric. Vitic. Afr. Nord, Algiers*, iii, no. 98, 24th Jan. 1914, pp. 83-85, 1 fig.

Agriculturists in the Philippeville district, in Algeria, decided to undertake general measures for control of the orange scale, *Chrysomphalus minor*. Three insecticides were tested : Polysulphides of calcium, petroleum-soap, and Cooper's Fluid. During the summer the Syndicat Agricole has sold at 75 centimes per kilog. (about 3½d. per lb.) a petroleum-soap prepared in the following manner :—A metal pot is placed in a pan containing water kept at boiling point and acting as a water bath ; in the pot 4 lb. of soft soap and 6 lb. of ordinary petroleum are mixed until the soap no longer sticks to the wooden spatula used ; the pot is then removed and its contents are quickly stirred for a few minutes until a soft paste is formed which stiffens on cooling. Of this paste 10 lb. is dissolved in 20 gals. of water, and as an average of 2 gals. is required per tree, the cost is about 3½d., or 4½d. including labour. In using Cooper's Fluid 1 quart is diluted to 25 gals. with water, the cost per tree being practically the same as for petroleum-soap. When inspecting the orange groves in the valleys of Zéramma and Saf-Saf in September 1913, a visit was paid at Oued Louach to the plantation most heavily infested by *Chrysomphalus minor*, *Parlatoria zizyphus*, *Coccus hesperidum* and *Pseudococcus citri*. The leaves were completely covered and the fruits nearly so. Trees treated with different insecticides were found in a satisfactory condition generally. The insects were dead on the leaves ; but on the fruit, though less numerous, they were nearly all alive. The young shoots were unaffected. Petroleum-soap mixture emulsifies with difficulty and this has caused injury to the plants and fruits ; Lorette powder was unsatisfactory ; Cooper's Fluid gave good results. At Oued Kaspa repeated spraying has checked the increase of the scales ; some burns had been caused by the petroleum-soap mixture and the polysulphides of calcium proved of doubtful value. M. François, head of the School of Agriculture, made use of polysulphides specially prepared under his supervision, and these were efficacious. On a large estate at St. Charles three applications of Cooper's Fluid resulted in very few scales being found. At Boufarik the polysulphides were a source of complaint, as having caused burns. The author thinks it chimerical to try to stamp out the orange scale at present in view of its universal occurrence, but it has now been shown that its ravages may be reduced to a minimum. Cultivators must consider it in the same light as vine-growers regard mildew, oidium and black-rot. The three insecticides recommended as a result of the 1913 tests are :—(1) the polysulphides of calcium, a safe product being obtained with 3 parts by weight quicklime, 3 parts sublimed sulphur and 200 parts water ;

(2) petroleum-soap, if well emulsified; (3) Cooper's Fluid, at a strength of 1 to $1\frac{1}{4}$ parts in 100 parts of water. Treatment must be effected at the following times:—One application after fruit-picking, when the young scales are not yet protected by the fourth envelope of their shield; a second application in spring, when vegetation starts; and two others during summer, the last being not later than the middle of September. If infection is slight, the leaves may be caused to fall (the orange scale only fastens on the leaves) by spraying with the following, after fruit picking:—Potassium carbonate 2 parts by weight, common salt 3 parts and water 100 parts. It is absolutely necessary that all cultivators should act in unison.

COMTE (—). **Les parasites du blé.** [Parasites of wheat.]—*Rev. Agric. Vitic. Afr. Nord, Algiers;* iii, no. 96, 97; 10th-17th Jan. 1914; pp. 31-33, 54-60; 14 figs.

*Hylemyia coarctata*, the wheat fly, which closely resembles *Musca domestica*, has injured wheat in Tunisia, where the author observed it in 1911 near Béja, Tunis, and Kairouan. Two generations occur annually. The larvae of the first gnaw the inside of the stem, causing the plant to turn yellow, but rarely killing it. They are always found at a depth of 1 to 3 centimetres underground. Pupation takes place in the stem during January and the imagines appear from February to March. The larvae of the second generation burrow in the secondary stems due to tillering; on reaching full development they leave the plant and pupate in the soil. The larvae are never found in the principal stems, which remain vigorous. Thus the past season, which was exceptionally dry, has largely favoured their increase, and tillering being also checked by the lack of moisture, the damage done was noticeable, whereas this is not the case in a moist season. The author has never observed this pest except on various kinds of wheat, though it has been stated that it injures barley and rye. The only advisable means of combat are to obtain by proper cultural methods, the use of manures, and the selection of vigorous seed suited to the soil, such robust plants as are able to withstand the injury and produce remunerative crops. The attack of the first generation is the most dangerous, and may be avoided to a certain degree by late sowing.

*Sitotroga cerealella*, is prevalent in French North Africa. The moths appear in May, and soon afterwards the females lay their eggs on the milky grains of wheat, barley and oats, wheat being preferred. About 50 to 80 eggs are laid. The young larvae penetrate into the grain, upon which they feed, and at harvesting and threshing time they are carried into the barns. In the early days of July the moths of the second generation appear and proceed to attack the wheat stored in the granaries, where a third and even fourth generation may be produced.

*Mayetiola* (*Cecidomyia*) *destructor*, Say, the Hessian fly, has caused serious damage to barley in Tunisia. In the author's experiments the life-cycle of the first generation took six weeks—from the 10th February to the 21st March; the second generation five weeks. In comparatively hot countries like Tunisia development is arrested during the months of July, August, and September. On Tunisian

barley four generations were observed from November 1912 to June 1913. Heat and moisture favour the pest, as they do the plant. Dryness retards development, and the author has kept pupae for a year in dry surroundings and then caused them to transform into adults by placing them in damp air. This proves that pupae left in the stubble after harvesting are able to resist the unfavourable conditions. In Tunisia numerous entomophagous parasites attack *Mayetiola destructor* and six species of Chalcids and two species of Braconids were obtained by breeding. At the time the adults of the first generation appeared in February 1912 hardly 10 per cent. of the pupae were parasitised ; of the second generation in March about 30 per cent. were parasitised, and by the end of April the figure was 80 per cent. The author discontinued observation as he believed complete control had been attained. He was therefore surprised to find a certain number of flies in the fields in February 1913. On investigating this, a number of dry-stored pupae from the Saint-Cyprien estate were examined, and it was found that while 80 per cent. had been parasitised, the remainder were still living and transformed into adults when kept in damp air for three weeks. In April and May infested barley was collected and kept dry ; the parasites hatched out, but the Cecidomyias remained in a state of arrest. The damage done by this pest amounts to many millions of francs in Algeria and Tunisia. Experiments appear to prove that the more water a cereal contains the more open it is to attack. In hot, dry climates those species which contain the least water will show the most resistance. As yet the ravages in wheat in Tunisia have not reached such a pitch as to permit of picking out the varieties most capable of resistance. Barley is badly attacked, and as the most vigorous plants contain the most water, they are also the most susceptible. In spite of this they have a surplus margin of vigour which compensates to a large degree for the losses caused by the pest. Late sowing is a good preventive when the winter is sufficiently cold to hold back the pest. Where the latter is rare in October, wheat, barley and rye germinate safely if sown late. In hot climates this method has no value. In Tunisia stubble-burning between the 15th July and the 15th September is very efficacious, because the fly is then passing through its larval or nymphal stages in the arrested state, and its parasites have already emerged. Owing to the danger of field and forest fires burning is subject to certain regulations in Tunisia. These regulations also require the destruction of the debris from threshing, as this is liable to contain pupae of *M. destructor*. Alternation of crops would be a very practical and economical method did not the wind aid in diffusing the pest, for the Cecidomyia only spreads slowly. Of curative methods, the author states that rolling is ineffective, because of the elasticity and unevenness of the soil. Insecticides are equally ineffective, because the generations follow without any order. Pasturing sheep on infested fields and mowing the green crop may be considered in rich soils, for the larva would thus be killed before it can reach the neighbourhood of the collar. The more water a cereal contains the more susceptible it is to attack ; entomophagous parasites may play an important role in control ; stubble-burning destroys the pest and favours its parasite. It should be made compulsory in infested districts. The wheat weevil *Calandra*

*granaria*, L., attacks other cereals as well as wheat, and even Italian paste (macaroni and the like). The softer varieties of wheat are attacked before the harder ones stored in the same granary. If the temperature remains constant at 59° F. one generation would follow another; but the colder temperatures cause a break in the development. In Tunisia four to six generations occur in a year according to the locality.

LAFFORGUE (G.). **Les pièges alimentaires dans la lutte contre la Cochylis et l'Eudémis.** [The use of bait-traps against *Clysia* and *Polychrosis*.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 2, 11th Jan. 1914, pp. 38-43.

Careful and extended experiments have shown that alcoholic fermentation must be present in the bait if the moths are to be attracted. The best bait is a 10 per cent. solution of molasses, to every 22 parts of which 1 part of wine-lees has been added. This latter is only necessary when starting operations, as molasses solution, added to maintain the level of the liquid in the traps, is fermented by the remains of the previous filling. Captures are not influenced by the size and shape of the containers, but fermentation is inconveniently rapid in small ones, while the quantity of fluid necessary and the evaporation therefrom increase with large ones. A pot of glass, or of earthenware glazed inside, with a depth of 3⅛ in., lip-diameter of 3⅛ in., and bottom diameter of 2 in., has proved suitable in practice, and 5⅝ oz. of liquid will fill it to two-thirds, this being the correct height. Two holes, under the lip and opposite each other, provide for suspension with a piece of iron wire. The pot must be placed slightly above the grapes, and in vineyards where three wires are used it is best placed close to the second wire. As the traps only attract moths in their vicinity their number must not be less than 80 per acre. Distribution must not be uniform, as the moths especially abound near buildings, hedges, clumps of trees, paths and the parts of rows most protected from prevalent winds. In such positions the traps must be closer than elsewhere; nor should they be stinted if a severe attack of the pests is anticipated. In 1911, 100 moths daily were taken from those examined on the 14th, 15th, 17th, 18th, 20th (oviposition began), and 23rd July. Of these 600 insects dissection showed that 322 were males, 254 were egg-bearing females, and 24 were females which had completed oviposition. On the 24th July, 39 dissections were made, 34 males and 5 egg-bearing females being found. The same search was prosecuted in 1912 with similar results and the conclusions arrived at are, that males are more numerous when the moths first emerge; egg-bearing females are captured next—this being the efficacious period of trapping; and finally, females which have laid their eggs predominate. Trapping is then of no further use, unless the continued capture of males prevents numbers of females from being fecundated. This point requires proof. Bait-traps are thus justified, provided costs are kept down. The best system is to place all the traps in position and only bait a few in the most likely places. These latter must be inspected regularly and on noting the first captures all the other traps must be baited and kept so until the catches diminish, when again a few of the first should be kept going—simply in order to

obtain data about the next generation. The following costs are based on practice with a vineyard of 10 hectares (25 acres); earthenware pots of the stated dimensions costing 4*s*. 9*d*. per 100 delivered at the nearest station; 3 complete fillings—1 for each generation, and 15 refills—one every third day during the three 18-day average periods, each refill being of 80 c.c. ($2\frac{5}{8}$ oz.) The total solution required is 3,300 litres (726 gals.), to prepare which a maximum of 350 kilogs. (770 lb.) of molasses costing 84*s*., and 150 litres (33 gals.) of wine-lees costing 24*s*. are necessary. The cost of 2,000 pots is 96*s*., which may be spread over 5 years, giving the cost for one year's operations as 19*s*. The total cost of labour (30 days at 2 francs) is 48*s*. Thus the total expense works out at £8 16*s*. per annum. The traps must be inspected about twice a week and all moths captured must be removed before re-filling to the original level. This system of bait traps is eminently suitable for application by co-operative associations.

**La destruction du Puceron Lanigère.** [Destruction of the woolly aphis.] —*Bull. Soc. d'Etude Vulg. Zool. Agric., Bordeaux,* xiii, no. 1, Jan. 1914, pp. 14-15.

Three formulae are given which, upon the advice of M. Duval of Boulogne-sur-Seine, have been used against the woolly aphis (*Schizoneura lanigera*) and have proved satisfactory. (1) In the case of leaves and young shoots newly invaded, apply a spray made up as follows :—Rain water, 1 litre; potassium carbonate, 4 gms.; sulphoricinate of soda, 30 gms.; methylated spirit, 30 gms.; nicotin (extract 100 grms. per litre), 10 gms.; the potassium carbonate is dissolved in water and the other ingredients added, the solution being boiled and stirred. Under the action of this spray the downy covering of the insects is dissolved and the insects themselves at length destroyed. (2) In the case of attacks on older parts of the tree, the spray must be applied as soon as the white down of the insects is observed; the foregoing formula may be used, but generally it is necessary to have recourse to some stronger spray, as at this time the insects are covered with a more resistant coat; the following formula is given :—rain water, 1 litre; sulforicinate of soda, 40 gms.; American potash, 12 gms.; methylated spirit, 20 gms.; and nicotin extract, 20 gms. This solution is liable to damage the leaves more than the other, but not seriously. (3) The third formula given is for destroying the eggs in winter; it is recommended to fill all crevices and holes in the trunk and branches at the end of October with the following liquid :—rain water, 1 litre; black soap, 350 gms.; sulforicinate of soda, 50 gms.; the soap is dissolved in warm water and the sulforicinate added, a thick syrup being formed, which can be applied with a brush. Woolly aphids which attack the roots should be destroyed at the end of November by opening the ground round the trees and spraying on the attacked roots the liquid recommended for the leaves and shoots.

Boucher (W. A.). **Orchard Work for February Codlin Moth.**—*Jl. Agric., Wellington, N.Z.*, xiii, no. 1, 1914, p. 87.

Fruit-growers in New Zealand are advised to spray with a reliable brand of arsenate of lead before the end of the second week of February. Serious infection by codling moth has often occurred in February when spraying has been discontinued at the end of January,

Durrant (J. H.) & Beveridge (W. W. O.). **Army Biscuit Enquiry: Supplementary Notes.**—*Jl. Royal Army Med. Corps, London*, xxii, no. 2, Feb. 1914, p. 208.

For practical purposes it has been necessary to ascertain the exact average dimensions of the ova of *Ephestia kühniella*, Z., and a table of careful measurements has been furnished by Major S. Lyle Cummins, R.A.M.C. The average length appears to be 1·16 (millimetres) and the breadth 0·63 (millimetres). From these measurements it would appear that if, when screening flour, a mesh of 160 strands to the inch be relied upon to eliminate the ova of *E. kühniella*, such reliance must rest upon the assumption that the ova of this moth always approach the screen broadside-on.

At a discussion as to the possibility of placing contracts at any specified date or dates, it was demonstrated that, so far as *E. kühniella* was concerned, any immunity from this insect cannot be hoped for during the winter months, since moths are recorded as emerging in September, October, and November, and they continue to emerge plentifully in December, January, etc.; in fact, the species seems to be normally an autumnal insect.

[The standard of measurement of the ova is not stated, but is assumed to be millimetres.—Ed.]

Champion (H. G.). **The Ravages of *Bupalus piniarius* in Prussia.**—*Entomologists' Monthly Magazine, London*, Feb. 1914, p. 41.

During a visit to the forests of the Oberförsterei of Salmünster, Hessen Nassau, the author had the opportunity of seeing the great extent to which the common Geometrid, *Bupalus piniarius*, can multiply, and the damage the larvae can cause to the Scots Pine. The pronounced thinness of the crown later in the summer shows where the so-called "Spanner" has been at work. The most serious attack was over some fifty acres, where the trees were 60–70 years old; in this area 336 pupae were found within 40 square feet; a few of these (some 6 or 7 only), appeared red and contained the larvae of an unknown parasite.

Jack (R. W.). **The Cabbage Web-Worm.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 3, Feb. 1914, pp. 416-422, 1 pl.

The cabbage web-worm, a pest of cabbage and allied plants, has caused serious damage from time to time in Southern Rhodesia. In the case of such plants as turnips, kohl-rabi, etc., which have swollen crowns, the caterpillar usually occurs within the tissues. In young plants of cabbage, kale, etc., the heart is attacked and the insect forms a groove in the stem and is covered by a web, under which it feeds. This insect is undoubtedly the same as that which, in the United States of America, is called the "imported cabbage web-worm" (*Hellula undalis*, F.) It seems to be susceptible to even light frosts and probably ranges from the Mediterranean to Southern Rhodesia as an indigenous species. Detailed descriptions of the various life-stages are given. The different broods overlap greatly, all stages being found throughout the growing season and during the greater part of winter wherever food is available. Lack of food between

July and September is probably an important check to this pest, which is little attacked by parasites. Most damage seems to be done on irrigated crops in November. Much injury may be avoided by spraying or dusting plants of the cabbage family as a preventive measure. Any arsenical preparation may be used, such as arsenite of lime, arsenate of lead or Paris green, and spraying should be commenced while the plants are in the seed bed. For use, 3 lb. of arsenate of lead is added to 50 gallons of water ; for Paris green, 1 lb. green and 2 lb. fresh lime (quick or water-slaked) is mixed with 160 gallons of water. In preparing arsenite of lime $\frac{1}{4}$ lb. of arsenite of soda is dissolved in a little hot water and made up to 25 gallons ; 2 lb. of fresh lime after slaking should be mixed with 25 gallons of water ; the two preparations can then be mixed. For dusting, use Paris green 1 lb., flour or lime 20 lb., thoroughly mixed together. For plants with smooth leaves a sticky substance should be added, such as a mixture of resin. This is made by boiling together 4 lb. resin, 2 lb. carbonate of soda crystals and 1 gallon of water. This quantity may be mixed with 50 gallons of spraying liquid and is most effective in connection with preparations containing lime. All plants should be destroyed as soon as their period of usefulness is past, since such plants, cabbage stumps, etc., serve as breeding grounds for insect pests such as web-worms, turnip sawfly (*Athalia rosae*), Bagrada bug (*Bagrada hilaris*), diamond-back moth (*Plutella* sp.), and cabbage aphis (*Aphis brassicae*), all of which occur in Southern Rhodesia.

Vuillet (A.). **Tableaux Illustrés.** [Illustrated Identification Tables.] —*Rev. Phytopath. App., Paris*, i, nos. 9-12, 5th Oct.-20th Nov. 1913, pp. 119-123, 138-140, 152-157, figs. 15. [Received 30th March 1914.]

These tables are intended to facilitate the identification of insect pests of cultivated plants in France and the neighbouring countries.

Gaumont (L.). **Contribution à l'Etude de la Biologie du Puceron Noir de la Betterave.** [Contribution to the Study of the Biology of the Black Aphis of the Beetroot.]—*Rev. Phytopath. App., Paris*, i, nos. 16 and 17, 20th Jan. and 5th Feb. 1914, pp. 4-5.

The black aphis of the beetroot (*Aphis euonymi*) every year causes considerable damage to the crops in north and central France. The insects appear at the beginning of June on the young sugar and fodder beetroots, as well as on those left for seed. They multiply abundantly during summer, so that the lower leaves of the plants become yellow and shrivel up and the inflorescences remain small. The same injuries have been noticed by Jablonovsky in Hungary and by Mordwilko in Russia. According to Mordwilko, the insects pass the winter in the egg stage on the European spindlewood (*Euonymus europaeus*, L.) and alburnum (*Viburnum opulus*, L.) From this it would follow that destruction of these shrubs would be of great value to agriculture. The author, however, has found *A. euonymi* also on Japanese spindlewoods, which are very numerous in parks and public gardens ; but even if all these shrubs were destroyed the aphis would still exist. The author observed at the end of October a field of beetroots in which

these insects were still present, both parthenogenetic and sexual forms, and the females were laying at the bases of the leaves. When the beetroots are gathered for fodder the leaves are taken away or else the leaves and the collar, and the roots are stored in a cellar or pits. The eggs remain in the collar, hatch while in the cellar and in the spring spread to *Rumex*, *Chenopodium* and other wild plants. If the beetroots are left to go to seed, the females issuing from the eggs form new colonies at the base of the plant from which they emerge. The small beetroots are often left in the ground, and if these have eggs on them may be a means of infection in the spring. Thus it would appear that destruction of *Euonymus* and *Viburnum* would really be of little value.

MIDDLETON (T. H.).—**Annual Report of Horticultural Branch, Board of Agric. and Fisheries,** *London*, 1914, 57 pp., 8 maps.

Among the insect pests which have been scheduled by the Board is the large larch sawfly (*Lygaeonematus erichsonii*, Hart.) Affected woods in the Lake District were inspected by two of the Board's Inspectors who concluded that a recrudescence of the infestation had taken place; the intensity of the attack being higher in the Keswick district, except in Borrowdale and part of Thirlmere. The position of the infested woods and details of the attack are given. From the results it seems certain that it is not possible to rely on the presence of parasites to effect a complete extermination of the pest, the average percentage of insects found parasitised in the different woods being only about 29·4. The parasites show no tendency to increase in numbers and it would almost appear that when the number of sawflies is small the parasites turn their attention to some easier prey. Many cocoons were found in the northern woods, the contents of which had been removed, in some cases as many as those found parasitised, and it seems probable, therefore, that some other factor injurious to the sawflies is present. The condition in Wales is very satisfactory, in many places only the merest traces being found, and in others the pest was absent. The sawfly as a pest appears to have vanished from Wales, which has now resumed the same condition as obtains in the rest of the Kingdom, though the number of parasites, so far as is known, was never in a higher proportion than in many parts which still remain infested. During the month of November 1912 the Board received a report of an infestation by the vine louse (*Phylloxera vastatrix*) in a vinery in Gloucestershire. The disease had been noticed some time, the leaves of the plants growing prematurely yellow and little or no fruit being borne, but it was not till the vines were grubbed that expert advice was taken. When an inspector from the Board called to investigate the case all the vines known to be affected had been burnt and all the soil removed from the house. It was decided to grub all the vines in a house not touched, and part of the root was submitted to the Board's entomologist, who reported the presence not only of *P. vastatrix*, but of *Heterodera radicicola*. Though *Phylloxera* can survive under exceptional conditions in England, it spreads extremely slowly and there is no reason for supposing that it can ever become a serious menace to English viticulture. In 1912 also a single case occurred where the larvae of the Mediterranean fruit fly (*Ceratitis*)

*capitata*) survived for a considerable time in England. Larvae were found in Seville oranges and puparia were obtained from the tissue paper in which an Almerian orange was wrapped. As far back as 1868 the fly was recorded in England, having been bred from oranges, and hundreds of these larvae or pupae are imported every year inside oranges, and are killed in the preparation of marmalade. The presumption is, therefore, that the same conditions which have acted unfavourably to the cherry fly (*Rhagoletis cerasi*) in this country, will stop the development of *Ceratitis* also.

The season of 1912–13 produced very few new conditions in the state of Isle of Wight Disease among bees. Reports of its presence from certain districts were received and from time to time it appeared epizootically in different counties. No treatment has been regularly successful in effecting more than a temporary improvement.

**La lutte contre les sauterelles: résultat des expériences de 1913.** [Locust control, results from experiments in 1913.]—*Bull. bi-mens. Off. Gouv. Gén. Alger., Paris*, xx, no. 2, 15th Jan. 1914, p. 26.

This article gives the detailed information supplied by M. Vermeil, Director of Agriculture for the Province of Oran, who was sent by the Algerian Government to watch the tests made in the Tagremaret district by Dr. Sergent, Director of the Pasteur Institute in Algeria, with the *Coccobacillus* employed by d'Hérelle in the Argentine against locusts. The hoppers experimented on had hatched from eggs laid in the previous autumn by *Stauronotus maroccanus*. Dr. Sergent first ascertained them to be free from d'Hérelle's *Coccobacillus*. A batch was inoculated with pure bouillon and remained healthy, while individuals of another batch inoculated with infected bouillon began to die on the third day, and all rapidly perished except two or three which remained immune right through. The blood of the dying hoppers was used to prepare fresh and more virulent cultures, and after the virus had been passed through 14 locusts it caused death in 7 hours. A further 4 or 5 passages did not reduce this period of time, and Dr. Sergent considered this to be the minimum. Later on, however, Dr. Sergent experimented with adult locusts in the district of Beni-Ounif and was able to cause death in one hour. M. d'Hérelle states that by spraying the grass and the insects about 95 per cent. of the latter will be infected and killed. In the experiments made by Dr. Sergent to ascertain this point a negative result was obtained. After several days about 95 per cent. were very much alive. Of course, this method would in any case be impracticable owing to the quantity of spray necessary, and M. d'Hérelle reported that only the leaders of a column required spraying in order to provoke a spread of infection throughout the locust army. This was also tested, but after some 100,000 to 150,000 hoppers had passed over infected ground, and their leaders had been sprayed as directed, it was difficult to find any dead except a few which appeared to have been the victims of insect-eating spiders. In spite of the care and patience with which all these tests were made their ill-success was clearly apparent. The evident contradiction may perhaps be explained by one of the following considerations :—(1) M. d'Hérelle may have been too sanguine, and the insects may have died quite independently of the *Coccobacillus* found in their

bodies; (2) it may be due to the fact that he experimented only on *Schistocerca pallens* and *S. paranensis*; (3) he used adult locusts and not hoppers, and that insects resist the bacillus least when they are nearest death is a well-known theory; or (4) his success may be due to the fact that the climate of Argentina, where M. d'Hérelle worked, is warmer and moister than that of the Tagremaret district; these two factors are always of great importance in insect life. Dr. Sergent is continuing his experiments with the hope of getting practical results.

J. D. **Die Kosten der Schädlingsbekämpfung.** [The cost of combating pests.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 1, 1st Jan. 1914, pp. 12-14.

As the calculations published by numerous journals differ rather considerably, the author gives the costs based on his personal experience and on accurate data collected from vine-growers. They cover the cost of the material necessary for a rational and thorough campaign against plant and animal enemies of the grape vine, but do not include cartage, wages, or any other cultural expenses.

*Spraying against Peronospora.* A 2 per cent. Bordeaux mixture was applied three times a year on an average. To be of use, thorough spraying is essential and for this 194 gals. of mixture, or 39 lb. of copper-sulphate and 39 lb. of lime, are required per acre for each application. The Grevenmacher Vine-growers' Association supplies its members with Bordeaux mixture ready for use at approximately 1*s.* for 20 gals. This entails an outlay of £1 9*s.* 6*d.* per acre for three applications and the protection of the 4,000 odd acres of vineyards in Luxemburg means an expenditure of £5,900.

*Sulphuring.* As a rule three applications are necessary, and for these 66 lb. of sulphur are required per acre at a cost of about 9*s.* per 100 lb. This works out at about 6*s.* per acre, or £1,200 for the 4,000 acres of vineyards in Luxemburg.

*Vine-moth control.* According to tests made in 1913, it is necessary to spray with nicotin twice a year if any result worthy of the name is to be attained. It appears best to make up 22 gals. of spray solution with 3 lb. 3 oz. of copper-sulphate, 3 lb. 3 oz. of nicotin extract at 1*s.* 1*d.* per lb. and 1 lb. 10 oz. of soft soap. This costs about 4*s.* 6*d.* For a single application 132 gals. are required per acre, or 264 gals. a year. The cost per acre per year is about 54*s.*, and the expenditure for Luxemburg would be about £10,800. The total expenditure for 4,000 acres will amount to over £18,000 per year, or £4 10*s.* per acre. As already stated this only covers cost of material required for control purposes.

Schilling (K.). **Sur Bekämpfung des Heu- und Sauerwurms.** [Combating the vine-moth.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 2, 15th Jan. 1914, pp. 28-30

At Geisenheim vine-moth control in 1913 included several trials which gave results as follows:—The insecticide "Golazin I'tötsi" was used with success against the second generation of the vine-moth and the grapes remained unharmed. They were also free from stem-rot. A quart of this insecticide cost 3*s.* 5*d.*, and 2 quarts diluted in 25 gals. of water at once gave the 2 per cent. working solution. On an average

158 gals. are required per acre. Spraying must always be effected in the period from the end of the moth-flight up to the appearance of the first caterpillars. High pressure sprayers are the best, and every grape must be thoroughly wetted. A single application of this insecticide costs about £5 15*s.* per acre. The makers state that if applied in the same manner it is equally effective against the first generation. Apparatus used with Golazin must be thoroughly cleansed with a 5 per cent. solution of ammonia before it is employed with copper-sulphate. Nicotin-soap gave very fine results. The spray was made up of 20 gals. of a ½ per cent. lime-copper-sulphate solution, 4½ oz. of 90 per cent. purified nicotin and 2 lb. of soft soap. The soap is dissolved in a known quantity of boiling water, the nicotin is slowly and carefully mixed in and the lime-copper-sulphate solution is finally added. Before this latter solution is added its strength must be greater than ½ per cent., as the amount of water used for dissolving the soap must be exactly allowed for. Nicotin-soap is mainly a control of the second generation and must be applied immediately the moth-flight is over—that is, from the 25th July onwards. Spraying is carried out as with Golazin. On an average 123 gals. are required per acre, and one man with two boys can cover that area in three days. Under local conditions the total expense will be about £3 4*s.* per acre. The same preparation, omitting the copper-lime mixture, was also tried, but the results were not so good. The treated grapes matured in a healthy condition, but took from two to three weeks longer to do so than those sprayed with Golazin. In making up the insecticide both the nicotin and the soap must be of the best quality. Cottonseed-oil soap is the best. A third test was made with a Hungarian product called "Kochillin" and was successful, although ripening was a little delayed. Kochillin is applied immediately after the vines are in flower, or immediately after the moth-flight of the second generation. It costs 2*s.* a lb. and is used as a 2 per cent. solution.

**Die Bekämpfung des Heu- und Sauerwurms im Rheingau mit einem Schweizer Insektizid.** [Combating the vine moth in Rheingau with a Swiss insecticide.]—*Neue Zürcher Zeitung, Zürich,* no. 341 Viertes Morgenblatt, 9th Dec. 1913.

The grape yield of 1913 has been the worst on record. Some growers, however, obtained remarkable results in combating the vine moth, which had generally been considered as beyond control, and averaged from one-third to one-half grape yield. The trials are referred to above, but the following data are new: In a vineyard of about 875 square yards treated with "Golazin I'tötsi" about 104 gallons of unstrained grape-must were obtained, while a neighbouring untreated one about 2,900 square yards only produced 82 gallons. In the former case treatment resulted in a full harvest.

Vuillet (A.). *Stephanoderes coffeae.—L'Agronomie Coloniale, Paris,* 31st Jan. 1914, i, no. 7, pp. 19-21,

Last September the Jardin Colonial received from the Lieutenant-Governor of the Gaboon a consignment of Liberian coffee berries attacked by a Scolytid beetle, which was found to be *Stephanoderes coffeae,* Hag. The female deposits an egg in the young fruit while it is still

green, towards the extremity or just above the scar left by the perianth. After about 8 or 12 days a white larvae emerges and penetrates into the berry. The larva completes its growth in three or four weeks and pupates in the seed, the adult insect appearing 15 to 19 days later. The presence of the beetle is revealed by two or three small holes, at the summit of the fruit. The pulp is simply crossed by the insect, and only the seeds are devoured by the larvae, so that at a certain distance the berries appear in good condition, containing only damaged seeds. According to Gowdey the best means of controlling *S. coffeae* is by gathering and destroying the attacked berries. This species proves to be widespread; the specimens originally described came from Uganda, but Hagedorn has since received examples from Angola, the Congo and Java. According to Morstatt it did not exist in German East Africa in 1912. In Uganda *Coffea arabica* appeared to suffer less from the attacks of this insect than indigenous coffee trees.

**Verwendung des Karbolineums an Obstbäumen.** [The use of Carbolineum on fruit trees.]—*Schweiz. Zeits. Obst- und Weinbau, Frauenfeld*, 12th Jan. 1914, pp. 8-10.

In this article reference is made to a paper by Wenk in the *Geisenheimer Mitteilungen über Obst und Gartenbau*, and the following remarks are all taken from it. The incorrect use of carbolineum has led to its being discarded entirely by many experts. If properly applied it is a valuable agent. Scale-insects are easily destroyed if the trunk and branches of the tree are painted with a 40 per cent. solution. This strength kills the scales, which is not always the case with weaker solutions. Spraying must not be done with solutions above 15 per cent. in strength, as the young shoots and buds will suffer. It is of the greatest importance that carbolineum be used only when the sap-flow is in abeyance. From the beginning of February to the middle of March is the period advised by Wenk, as then the insects are leaving their winter refuges and, on the other hand, shoots and buds have not yet appeared. When they do so the use of carbolineum must be immediately discontinued. The product itself must be completely soluble in water and the actual percentage of carbolineum contained in it is of great importance, and should be guaranteed, as some inferior makes may contain over 90 per cent. of water and would prove very expensive in use. [See this *Review*, Ser. A, ii, p. 210.]

Pierce (W. D.). **New Potato Weevils from Andean South America.**—*Jl. Agric. Research, Washington*, i, no. 4, Jan. 1914, pp. 347-352, 3 pl.

Potatoes sent to the United States from South America were found on several occasions to contain weevils, in all stages of development. Three species of weevil are involved, one of which, *Rhigopsidius tucumanus*, Hiller, has been already reported as found in potatoes shipped from Chile, Peru and Bolivia. [See this *Review* Ser. A, I, p. 546.] The other two species, described in the present paper, are new and represent new genera. One of these, *Premnotrypes solani*, was found in the adult stage, just under the skin of the potato, in a small cell in which the larva had evidently fed; from the material

received it is judged that the larva does not bore extensively into the potato. The other species, *Trypopremnon latithorax*, was found in cells in potatoes received from Peru ; it breeds in a manner closely resembling that of *P. solani*.

Ballard (W. S.) & Volck (W. H.) **Winter Spraying with Solutions of Nitrate of Soda.**—*Jl. Agric. Research, Washington*, i, no. 5, Feb. 1914, pp. 437-444, 2 pls.

The main object of the experiments set forth in this paper was not so much the destruction of insect or fungus pests, as an attempt to feed trees and shorten their dormant period by spraying with nitrate solution, and the results, from this point of view, are interesting. The solution found to be most satisfactory consisted of nitrate of soda 200 lb., caustic soda 25 lb., water 200 gals. The result was to force the dormant buds out several days ahead of the normal opening period, and the apparent strengthening and increase of vigour of the trees was possibly useful in enabling them to resist the attack of insect and fungus pests.

Chatterjee (H. C.). **A Note on** *Oxyrhachys tarandus*, **Fabr.**—*Ind. Forester, Allahabad.* xl, no. 2, 15th Feb. 1914, pp. 75-79, 2 pls.

*Oxyrhachys tarandus* (Membracidae) occurs in many parts of India and is widely distributed in Africa. Among its food-plants are *Acacia siamea*, *A. arabica*, and *Casuarina* sp., reported from Madras ; *Cassia fistula* and *A. arabica*, reported from Bihar (Pusa) ; *A. catechu*, *Albizzia lebbek*, *Albizzia procera*, *Phyllanthus emblica*, *Tamarindus indica* and *Dalbergia latifolia*, from Dehra Dun District. Injury is caused by the insertion of the proboscis into the young stems in order to suck sap, and to a greater extent by the incisions made by the saw-like ovipositor of the female while laying her eggs. The trees attacked become stunted and more exposed to the attacks of other insects. The eggs are laid in the bark of the young shoot, but there is very little definite information as to the length of the life-cycle. Descriptions are given of the egg, larva, nymph and adult. Until the life-history of this insect is worked out, no proper remedies can be laid down. In small nurseries and gardens where the insect is abundant the following measures may be adopted : spraying with kerosene and soap emulsion, keeping the ground between the trees clean and constantly ploughed, and handpicking. The eggs of *O. tarandus* have been found parasitised by a Chalcid.

Trägårdh (I.). **Gran- och tallkottarnes vanligaste skädeinsekter.** [The most common insect pests of pine and fir-cones.]—*Skogen, Stockholm*, i, no. 2, Feb. 1914, pp. 42-50, 5 figs.

*Pissodes validirostris*, Gyl., has on several occasions done great harm to fir-cones. The adult makes its appearance in July in the neighbourhood of Stockholm and feeds on the young cones ; the larva hibernates in the middle of the cones and pupates in the spring, only one generation occurring a year. The attacked cones are easily recognised by their pale brownish yellow colour, which contrasts with

the green colour of the undamaged cones. They are very easily shaken off the trees, which makes it very probable that, as a rule, they drop to the ground before they are ripe. In 1907, on the island of Gotland, 22–27 per cent. of the cones were damaged by this weevil. This year Mjöberg found no less than 80 per cent. of the larvae parasitised, a fact which seems to indicate a possible method of fighting the insect. The Anobiid beetle, *Ernobius abietis*, makes its appearance in July; the amount of damage it does in Sweden is not known

*Laspeyresia strobilella* occurs throughout Sweden to Lapland. The cones attacked by the caterpillar very often do not differ in appearance from healthy cones. In the autumn the larva does very little damage to the cones, only 6–10 per cent. of the seeds being devoured, but if they are stored in a warm room during the winter the seeds are attacked one after the other, so that by April or May all of them are eaten It follows from this that the earlier the seeds are shelled the better.

Another cone moth, *Dioryctria abietella*, has not been recorded as doing any harm until last summer, when the author found it plentiful everywhere in the vicinity of Stockholm. Its mode of attacking the cones differs greatly from that of *L. strobilella*, it being much larger and accomplishing its feeding in the autumn. As a consequence it devours a much greater part of the cone than *strobilella*, and furthermore it throws out heaps of frass on the surface of the cone. It makes winding galleries in the centre of the cone, feeding on the seeds and on the basal parts of the scales, the latter becoming anchor-shaped, as already observed by German entomologists.

The seeds of these conifers are also attacked by an, as yet, undescribed Chalcid of the genus *Megastigmus*, and by gall-midges which are not identical with those described from Austria.

Smith (H. S.). **Mealy Bug Parasites in the Far East.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 26-29.

In this paper the author reports on his visit to Japan and the Philippines with a view of obtaining natural enemies for Californian pests. Attention was first turned to the enemies of *Pseudococcus citri*. In Japan, where the mealy bug is never a pest of any importance, three enemies of this insect were found. One is a ladybird, the name of which is unknown to the author; it resembles *Cryptolaemus montrouzieri*; the others are parasitic wasps, a small metallic blue Encyrtid and a Proctotrupid, which lay their eggs in the very young mealy bugs. A good breeding stock of these parasites is now in the insectary in California. In the Philippines *P. citri* was not encountered, though a similar species occurs, and the ladybirds *Pullus fuscatus* and *Aspidimerus orbiculus* were found feeding on it. *Spalgis substrigata* was found to be a very important factor in the control of mealy bugs. A single larva of this butterfly would frequently clear an entire twig of mealy bug larvae and eggs; but this type of insect is very difficult to breed in confinement. Two species of Chalcid flies were also found attacking *Pseudococcus*, but to a far less extent than the foregoing insects. Two species of Diptera of the genus *Diplosis* do good work against mealy bugs of guava and *Hibiscus* in the Philippines, feeding in the larval stage upon the eggs and young. Several other enemies

of the mealy bug are found in the Orient, but they are of minor importance. In the vicinity of Manila a number of parasites of *Saissetia hemisphaerica* were obtained in the hope that they would attack the black scale in California. This they seem to do in the insectary, but they have not been tried in the field. One Pteromalid attacks the eggs of the scale. Two other Encyrtids attack the young scale before eggs are laid. Tentative arrangements have been entered into with the Imperial Department of Agriculture of the Japanese Government and the Bureau of Agriculture of the Government of the Philippines for co-operation with the State Commission of Horticulture at Sacramento in the attempt to introduce the natural enemies of Californian pests.

COOK (A. J.). **The White Grubs.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 29-30, 1 fig.

White grubs (the larvae of various Scarabaeid beetles) feed on roots of grasses and other plants. The rose chafer, *Macrodactylus subspinosus*, of the Eastern States causes much damage. The various May beetles are also serious pests, devastating lawns and meadows and working havoc in strawberry beds and among vegetables. The common one in California is *Ligyrus gibbosus*, and in Michigan *Lachnosterna fusca*. As a control measure, if the meadow is seriously attacked, it should be ploughed up and some other crop grown. A badly attacked lawn can be treated in the same way and clover may be substituted, as it is not affected. On lawns, carbon bisulphide can be used, $\frac{1}{4}$ oz. of the liquid being poured into holes about three feet apart, which should at once be closed.

ESSIG (E. O.) **The Cherry Fruit Sawfly.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 31-35, 3 figs.

The cherry fruit sawfly (*Hoplocampa cookei*) was first reported from the Suisan Valley, Cal., in 1883. It is a native of California and other Pacific Coast States. Considerable damage has been done to cherry crops by the larvae, the injury consisting of one or more clean round holes bored through the fruit to the kernel, which, if soft, is devoured, as well as the fleshy part around it. The fruit becomes discoloured and falls to the ground. It is stated that in order to control this sawfly effectively, from two to three applications of lead arsenate, at the rate of 4 to 5 lb. of arsenate to 100 gals. of water, may be necessary. As a rule two good applications are sufficient, the first being made shortly before the blossoms open and the second about ten days later. Autumn ploughing is recommended to kill the larvae and pupae in the soil. A 3 per cent. distillate-oil emulsion, to which has been added nicotin sulphate at the rate of one part to 2,000 parts of water, has also been suggested. The insect has been reported as occurring in the Suisan Valley, El Dorado and Nevada counties, California, and at Medford, Oregon, where it is confined to a very small area. The orchard fruits reported to have been attacked are cherry (sweet and sour), prune, plum, peach and apricot (the last two only occasionally).

Cook (A. J.). **The Cherry and Pear Slug.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 40-41, 1 fig.

The pear slug *Eriocampoides* (*Caliroa*) *cerasi*, is a sawfly of European origin and is widely distributed, occurring wherever the cherry and pear are cultivated. The eggs are deposited in the stem or leaf in late spring and early summer. The larvae feed on the green parts of the leaves, attacking chiefly the cherry and pear. Arsenicals are very effective against these insects, but, owing to their viscid secretion, lime or even earth-dust thrown on them is an excellent means of destroying them.

Fawcett (H. S.). **Does Bordeaux Paste cause Injury when followed by Fumigation?**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 41-43, 1 fig.

It has been noticed that if spraying with Bordeaux mixture is followed too soon by fumigation with hydrocyanic acid gas, the trees are more likely to be injured than those not sprayed, resulting in partial defoliation and killing back of the small twigs. This does not seem to be true in the case of lime-sulphur spraying. Trees were treated with Bordeaux paste on the trunks and fumigated soon afterwards; no apparent injury resulted. This has been successfully repeated several times. It would, therefore, seem that where the proper precautions as to weather and moisture conditions are observed by the fumigator, there is no injury to be feared from the Bordeaux paste, even when applied to the large limbs.

Essig (E. O.). **Insect Notes.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, p. 47.

The sweet-birch scale, *Chionaspis salicis-nigrae*, Walsh, was taken by the author recently in the Sierra Nevada Mountains, where it appears to be common, east of the Sacramento Valley. The sweet birch, *Ceanothus integerrimus*, H. & A., is generally attacked at the base near the ground, and the infested areas appear as if whitewashed. In not a few cases the entire bush was killed by this insect. The pine-leaf scale, *C. pinifolia*, is exceedingly common on *Pinus ponderosa*, Dougl., in the vicinity of Forest Hill (Placer County), as also is the black pine-needle scale, *Aspidiotus californicus*, Colm. In the same county *Kermes cockerelli*, Ehrh., and *Aspidiotus densiflorae*, Bremner, were taken from *Quercus chrysolepis*. The destructive grasshoppers, *Melanoplus devastator*, Scudd., *M. cinereus* and *Schistocerca venusta*, Scudd., were found along the north fork of the American River.

Cook (A. J.). **Alfalfa.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 53-73, 17 figs.

In a lengthy article on the cultivation of alfalfa, the author notes among the pests of this crop in California the following insects:—Army worm (*Peridroma margaritosa* var. *saucia*), locusts (Acridiidae), the alfalfa butterfly (*Colias eurytheme*), wireworms (Elateridae), the alfalfa looper (*Autographa gamma californica*), the alfalfa crane-fly (*Tipula simplex*), the apple leaf-hopper (*Empoasca mali*), clover mite (*Bryobia pratensis*), grain thrips (*Euthrips tritici*), grass leaf-hopper

(*Typhlocyba comes*), the twelve-spotted cucumber beetle (*Diabrotica soror*), the western army worm (*Chorizagrotis agrestis*) and the serpentine leaf-miner (*Agromyza pusilla*). Poisoned bran-mash placed in affected areas kills both the army worms and locusts. The hopper-dozer, with a shallow pan of kerosene oil, drawn through the field will often capture the hoppers by the millions. The alfafa weevil, *Phytonomus posticus*, has not yet been found in California. [For list of Russian and European pests of lucerne, see this *Review*, Ser. A, i, pp. 526–27.]

CHILDS (L.). **The Large Narcissus Bulb Fly.**—(*Merodon equestris*, **Fab.**) —*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 73-76, 2 figs.

This fly, belonging to the family SYRPHIDAE, in the larval stage causes much damage to narcissus bulbs. The native habitat of *Merodon equestris* is Southern Europe, whence it has spread into England and Northern Europe and later to America and New Zealand. The larva feeds vigorously on the soft scale of the bulb, hollowing out the centre, so that infestation is often difficult to detect. The larva, pupa and adult are described. The eggs are laid at the base of the leaves and the larvae later bore into the bulb. The treatment of infested bulbs has been dealt with by Mr. R. Stewart MacDougall [see this *Review*, Ser. A, ii, pp. 88–89.] The following plants have also been reported to have been attacked by *M. equestris* : *Amaryllis*, *Vallota*, *Habranthus*, *Eurycles*, *Saltonia*, and the bulbs of the wild hyacinth, *Scilla nutoris*.

SMITH (H. S.). **The Season's Work with** *Hippodamia convergens*.—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 77-78.

During the season of 1914 it is hoped to carry on the distribution of this beneficial insect on a greater scale than in the past. Mr. Branigan reports a number of colonies, not before utilised, in the Sierras, and it is hoped to exceed the hundred million before the end of the year. Owing to the repeated damage caused by *Aphis avenae* to barley from February until the melon aphis season, it is proposed to release *Hippodamia convergens* upon the barley aphis during February, and by this means it is hoped to check the melon aphis plague in Imperial County.

NAKAYAMA (S.). **A Japanese Formula for Destroying the Woolly Aphis.** —*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, p. 80.

Mr. T. Machida, of Japan, recommends for the woolly aphis the following mixture :—Rape-seed oil, 3⅓ pints ; sulphur, 1½ oz. ; turpentine, 7⅓ oz. The rape-seed oil should be boiled alone for a short time and then the turpentine slowly added and thoroughly mixed. Next stir in the crushed sulphur. The attacked parts of the tree are painted with this wash, which is also recommended for other aphids and for the destruction of their eggs.

VOSLER (E. J.). **Calendar of Insect Pests and Plant Diseases.**—*Mthly. Bull. Sta. Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 81-85.

The author suggests the following methods of control for insect pests to be carried out at about the time he writes. The almond mite, the eggs of which are deposited in the autumn on the twigs, hatches in spring and damages the tender growth. Commercial lime-sulphur solution with flour paste seems effective in the control of this pest. The following formula is suggested :—100 gals. water, 4 gals. flour paste, 5 quarts lime-sulphur solution, 2 lb. iron-sulphate. Another mite destructive to fruit is the pear-leaf blister mite, which can only be controlled commercially in the adult stage, as the eggs and young are inside the leaves. A. L. Quaintance recommends a lime-sulphur wash of 20 lb. lime, 15 lb. sulphur, and water to make 50 gallons. The application should be made just before the leaves are out. The spring canker-worms, attacking the foliage of the elm, cherry and prune, may cause entire defoliation of their host. In early spring the wingless female moth crawls up the tree to deposit its eggs on the bark. Tree tanglefoot or any adhesive bands will prevent the ascent of the female, and the eggs laid below the bands can be readily destroyed. Arsenate of lead, 5 lb. to 100 gals. of water, sprayed on the foliage will destroy the young caterpillars. The government formula for spraying pear thrips consists of 3 per cent. distillate emulsion combined with "Black-leaf 40," 1 to 2,000 parts of water. Among the citrus fruit insects the citrus mealy bug is discussed. E. O. Essig finds that a carbolic acid emulsion spray, plentifully applied (10 to 15 gallons to an average-sized tree), is the best remedy. Sometimes two or four applications, a week apart, are necessary ; winter or early spring spraying seems the best. Fumigation has given good results, but has not been so effective as the emulsion. The ordinary black scale dosage is the one generally used. No practical remedy for the grain aphis, at the time they appear in spring, is known. The asparagus beetle appears as soon as the asparagus shoots emerge from the ground. Control measures used against this insect consist of cutting and burning egg-infested shoots, and after the crop has been harvested, spraying the plants with arsenical sprays, using 1 lb. of arsenate of lead to 16 gallons of water.

ESSIG (E. O.). **Insect Notes.**—*Mthly. Bull. State Comm. Hortic. Sacramento, Cal.*, iii, no. 2, Feb. 1914, p. 85.

J. P. Lyons reports *Aphis avenae*, F., doing serious damage to oats in the Imperial Valley. The maple plant louse (*Drepanaphis acerifolii*, Thos.,) has been reported as occurring on maple at Hanford, Cal., and the author has repeatedly taken it at Sacramento. *Aspidiotus perniciosus*, Comst., has been found in large numbers in pear orchards in Yolo County, near Sacramento, and *A. hederae* has been found on palm leaves. The following species of *Pseudococcus* have been taken in the vicinity of Upland, Cal. :—*P. crawii* on white sage ; *P. artemisiae* on *Artemisia californica* ; *P. bakeri* on the foliage and fruits of oranges and lemons, roots of nightshade (*Solanum douglasii*) and wild sunflower, also upon Grevillea, ivy, *Senecio* and other ornamental

plants; and *P. solani* on the roots of nightshade, wild sunflower and tomatoes. *Tortrix citrana* is also common in Upland on orange trees.

Vassiliev (E. M.). **Два новыхъ для Россіи вредителя сахарной свекловицы изъ Туркестана.** [Two insect-pests of sugar-beet from Turkestan, new to Russia.]—**«Вѣстникъ Сахарной Промышленности.»** [*Herald of the Sugar-Industry*], *Kiev*, no. 3, 1st Feb. 1914, pp. 68-75.

Before the establishment of the Entomological Station of Turkestan in Tashkent in 1911, very little was known of the insects injurious to sugar-beets in that country. In an article by the author published in 1906 he recorded some of these, namely, *Stauronotus maroccanus*, Thb., *Chloridea obsoleta*, F., and the larvae of an unknown species of Elateridae. In the first report of the above station, published in 1912, two new pests of sugar-beets are mentioned: *Laphygma exigua*, Hb., and *Phlyctaenodes nudalis*, Hb. According to the author, the latter insect is quite a new pest of sugar-beet, as up till now only two species of the genus *Phlyctaenodes* were reported as injurious to this plant, *P. sticticalis*, L., and *P. similalis*, Guen. The information given in the report as to *P. nudalis* is very scanty, only the damage done by the caterpillars to the young central leaves being mentioned. As to the natural food-plants of this species, only *Camphorosma annua*, Pall. (Chenopodiaceae) and *Echium* (Boraginaceae) have been previously recorded. The author suggests the following remedies: (1) the destruction of weed grasses; (2) the destruction by burning or by naphtha of the sprouts of beet taken out while digging; and (3) the catching of the insects on fermenting molasses.

The geographical distribution of *Laphygma exigua* is very great, it being found in Europe, Asia, Africa and America. The caterpillars injure maize and potatoes in South Europe; maize, beet and cotton seed in North America; cotton seed, lucerne, maize and sugar-cane in Egypt; and, in addition to all these plants, also cabbage, *Hibiscus*, *Corchorus*, *Carthamus*, *Amaranthus*, lentils, etc., and especially *Indigofera tinctoria* in India, where they are most injurious. In Russian Turkestan injury by this pest was noticed from the beginning of June 1911; in one locality in the district of Tashkent they devoured in 1911 about 540 acres of beet-root, in addition to damaging various other crops. In Turkestan the insect winters in the pupal stage, whereas in North America it is the moths that hibernate. The number of generations of this pest is two in America, three in Southern California and two (May-June and September) in Europe; the number of generations in Turkestan is unknown. As enemies, Tachinids are mentioned, which are responsible for the destruction of about 50 per cent. of the caterpillars in India, also a Sphegid wasp (*Ammophila* sp.) some predaceous beetles, bugs (*Canthacona furcellata* in India) and birds. Nothing is known of its enemies in Turkestan or Astrachan.

The following remedies are suggested. Against the imago, trapping with fermenting molasses; it is important to set the traps before oviposition has taken place. In India, the eggs are collected by hand, and lucerne is grown as a bait plant, being cut and destroyed at the proper time. The author suggests also the removal from the plantations and the destruction of weeds and all plants which have been hoed up.

Against the caterpillars, spraying with a solution of Paris green and lime in water (1–1½ oz. of green and the same amount of lime in 2·7 gallons of water) is considered the best remedy in Turkestan; "Djipsin" and barium chloride gave negative results. In India and North America arsenical sprays are used, and also kerosene emulsion in America. In India the attacked fields are surrounded by trenches as traps. Against the pupae, the cultivation of the soil is suggested by Plotnikov; it has also been noticed that the pupae perished when water was poured over them, so that by combining spraying and watering the pests may be rapidly destroyed.

DEAN (G. A.). **Grasshopper Control Work in Western Kansas.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 67-73, 2 pl.

A very successful campaign against grasshoppers was carried out in the summer of 1913 in Western Kansas, where for some years past these insects had devastated acres of cultivated land. The most common species were *Melanoplus differentialis*, *M. bivitattus*, and *M. atlantis*. In the control work poisoned bran mash, made according to the following formula, was used: Bran 20 lbs., Paris green 1lb., syrup 2 qts., 3 oranges or lemons, water 3½ gals. The bait when flavoured with oranges or lemons was found to be more attractive to the grasshoppers. The damp mash was sown broadcast in the infested area early in the morning; using the above quantities it should be scattered so that 5 acres are covered. As the poison does not act quickly the insects are not found dead until two or three days later. A very small quantity of the poison is sufficient to cause death.

The success met with in the campaign described in the present paper was largely due to the co-operation of most of the farmers with the county commissioners, who had circularised the farmers giving them the exact methods to adopt and supplying them with the necessary ingredients for the poison. In some counties 60–70 per cent. of the insects were killed, in others as many as 90 per cent.; in all cases the few that remained were kept in check by their natural enemies.

HUNTER (S. J.) & CLAASSEN (P. W.). **Grasshopper Control in the Southern Division of Kansas.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 73-83, 3 pl.

The University of Kansas, which for several years has been associated with the problem of grasshopper control in the State, organised in 1913 a campaign against these insects, which received the co-operation of most of the farmers of Southern Kansas. The method of control employed, similar to that employed in Western Kansas, consisted of distributing poisoned bran mash in the infested areas. The formula for the bran mash was as follows: Paris green or white arsenic 2½ lb., bran 50 lb., 6 oranges or lemons, syrup 4 qts., water 5 gals. The dry ingredients are mixed together, and then the syrup and oranges or lemons; the water is not added until the day of use. The bait is scattered broadcast in the infested areas between 5 and 7 o'clock in the morning.

Chickens eating the poisoned grasshoppers do not appear to be affected. The bran mash loses its effect as soon as it is dry. In alfalfa fields about 240,000 grasshoppers were killed per acre with one application. Poison for this experiment was scattered broadcast through the field, using 4–5 lb. to the acre at a cost of not over 6*d.* per acre. This was carried out in a field where the alfalfa was fully grown ; a more effective means is the mowing of the field, leaving strips of standing alfalfa 4–6 feet wide and about 75 yards apart. The grasshoppers soon collect in these strips and are thus readily poisoned with small amounts of the bran mash, or easily caught with the hopper dozer. By these means a grower of the largest crops of alfalfa was able to harvest three crops before the first of August, where in an untreated field, kept as a control near by, only one crop was harvested in the same time.

Experiments were made to determine the attractiveness for the insects of baits where the expensive lemons were replaced with less expensive ingredients such as anise oil, stale beer, or vinegar, or left out altogether. The experiments showed that the insect has a keen sense of smell and is easily attracted to the bait put out for it ; lemons render the bait 26·5 per cent. more effective than any of the other ingredients tried.

BURGESS (A. F.). **Outline of the work on the Gipsy Moth and Brown-tail Moth conducted by the Bureau of Entomology, U.S. Department of Agriculture.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 83-87.

The author gives an account of the methods adopted to prevent the spread of the gipsy moth (*Lymantria dispar*) and brown-tail moth (*Euproctis chrysorrhea*) from the infested region in New England to other parts of the United States. The experimental work consists of the study of the life-history and habits of parasitic and predaceous enemies, with a view to propagating them in the infested areas ; field observation work is done during the summer and autumn, and records kept of the increase or decrease of the species in a given area, and of the defoliation on the trees concerned ; food-plant work is carried on in the laboratory, caterpillars of the gipsy moth being fed on selected food-plants, and records kept of their preferences for different plants ; factors concerned with spread of the insect are investigated, such as wind, temperature, etc. Investigations on the wilt disease, which attacks the gipsy moth caterpillars and destroys large numbers of them, are being conducted. Many trees that have been defoliated by the gipsy moth are attacked by bark borers (SCOLYTIDAE) ; oak trees suffer seriously in this respect : attempts are being made to determine whether such pests can be controlled economically.

Work is being done in co-operation with the Forest Service to determine whether different species of timber trees are more or less resistant to moth attacks. The territory infested by the gipsy moth and brown-tail moth has been placed under quarantine, and regulations have been made providing for the inspection of forest and nursery stock that is shipped from the infested territory to other parts of the United States. The country adjoining the infested territory is under inspection.

Rogers (D. M.). **The Gipsy and Brown-tail Moth Quarantine.**—*Jl. Econ. Entom. Concord.*, vii, no. 1, Feb. 1914, pp. 116-117.

An account is given of what is being done by the U.S. Department of Agriculture to prevent the spread, by the inspection of various products, of the gipsy and brown-tail moths. The area quarantined on account of the gipsy moth includes parts of Maine, New Hampshire, Massachusetts and Rhode Island—about 15,230 square miles. The brown-tail moth area includes all the gipsy moth area and about 17,000 square miles in addition, affecting portions of each of the New England States. The inspection of plants and forest products includes the examination of lumber, cordwood, logs, poles, posts, bark, pulp wood, rough lumber used in crating finished products, barrel hoops, barrels, boxes and other products which might be chosen by a gipsy moth as a place on which to deposit her eggs. Many commodities not strictly included in products of the forest were examined, such as stone taken from quarries in woodlands in the infected areas, on which egg-clusters are often deposited.

Davidson (W. M.). **Plant-Louse Notes from California.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 127-136, 8 figs.

The following species of Aphididae have been taken in different parts of California, and short notes are given of their mode of occurrence, migrating habits, life-histories, etc. :—*Pemphigus californicus*, Davidson, on leaves of ash ; *Lachnus thujafolinus*, Del Guercio, on cultivated Thujas ; *L. ponderosae*, Williams, on *Pinus ponderosa* ; *Phyllaphis* ? *querci*, Fitch, on *Quercus agrifolia*, Nee ; *Chaitophorus* sp. on *Quercus lobata*, Nee ; *Euceraphis betulae*, Kalt., on cultivated birches ; *Eucallipterus arundicolens*, Clarke, on leaves of bamboo ; *Myzocallis quercus*, Kalt (?), on *Quercus robur*, L. ; the last four are fully described ; *Monellia caryella*, Fitch, on leaves and nuts of *Juglans californica*, Watson ; *Aphis hougtonensis*, Throop, on wild currant ; *A. frigidae*, Oestl., on *Artemisia californica* ; *A. atriplicis*, L., on *Chenopodium murale* and *C. album* ; the last two are described ; *A. bakeri*, Gillette, on sunflowers, artichokes, etc. ; *Hyadaphis xylostei*, Schrank, on *Conium maculatum* ; *Rhopalosiphum nervatum* sp. n., on hazelnut ; *Myzus fragaefolii*, Clarke, on strawberry leaves and stalks ; the last two are described ; *Phorodon galeopsidis*, Kalt., on *Polygonum* sp. ; *Amphorophora rubicola*, Oestl., on thimbleberry (*Rubus nutkanus*) ; *Macrosiphum ludovicianae*, Oestl., on *Artemisia heterophylla* ; *M. rudbeckiae*, Fitch, on the teasel.

Parker (J. R.). **The Life-history of the Sugar-beet Root Louse** (*Pemphigus betae*, **Doane**).—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 136-141.

*Pemphigus betae* is the most important pest of the sugar-beet in Montana, and each year does considerable injury, the tonnage in badly infested fields sometimes being reduced to a third. The life-cycle of the insect has been worked out and is briefly as follows. Wingless viviparous females are found upon the roots of beets, weeds and grasses all the year round ; in the autumn winged individuals are produced which fly to cottonwood trees and deposit the true sexes ; the sexes

mate and the female deposits a single winter egg in the crevices of cottonwood bark ; the following spring the young louse hatching from the egg ascends the tree and forms a gall, in which a single generation of lice is produced, all of which are winged and become the summer migrants ; these migrants fly to beets, weeds and grasses and upon the leaves of these plants give birth to young which descend to the roots and start new colonies of wingless viviparous females.

Matheson (R.). **The San José Scale in Nova Scotia.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 141-147, 1 fig.

In that part of Nova Scotia extending from Windsor to Digby, known as the " fruit belt," the San José scale (*Aspidiotus perniciosus*) appeared for the first time in 1911. In spite of the severity of the climate compared with that of the more southern areas infested by this insect, it has survived through two winters and in 1913 gave rise to two complete generations, a third being expected. In the spring of 1913 a thorough inspection was inaugurated, the object of which was to find out the number of trees destroyed by the scale on various properties under different conditions of cultivation, size, spraying methods, etc. The details of these conditions are not cited, but tables are given which show that the number of trees destroyed in 1913 after control methods had been adopted was greatly reduced from the number destroyed in 1912, before such control had been begun. The author believes that it is possible to eradicate this pest, or to keep it in check so that there will be no danger of the old orchards becoming infested, provided that the regulations governing the admission of nursery stock into the province be properly enforced.

Newell (W.). **A natural enemy of the Argentine Ant.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 147.

The abundance of the Argentine Ant (*Iridomyrmex humilis*) in the southern part of Louisiana and Mississippi is probably due to the absence of both parasites and predaceous enemies. In September 1913 ants, identified as *Eciton* (*Acamatus*) *schmitti*, Emery, were found raiding the colonies of *I. humilis*, destroying adults and carrying off the larvae and pupae ; the Ecitons appear to be very effective in their predatory work, destroying practically all the individuals of *I. humilis* in the territory which they raid, and in some of the orange groves which were formerly threatened with complete destruction, on account of the great abundance and activities of *I. humilis*, hardly a specimen of that species can be found since the visit of the Ecitons. The territory where the Ecitons have been found is on the west bank of the Mississippi, below New Orleans ; this territory is almost completely surrounded by water, so that it is improbable that the Ecitons will be able to leave it ; the species has probably been established there for many years past. This ant, which is the first important enemy of the Argentine ant to be discovered, belongs to the same family as that species itself.

Cockerell (T. D. A.). **A new Cotton Scale from Panama.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 148.

A new species of scale-insect, *Icerya zeteki*, is described from a specimen in a collection of Coccidae made in the Panama Canal Zone. The plant on which the insect was taken was undetermined.

Felt (E. P.). *Acaroletes pseudococci*, **sp. n.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 148-149.

A new species of midge has been reared by Prof. Quale from *Pseudococcus citri*, collected by him in Sicily, and is described under the name *Acaroletes pseudococci*.

King (G. B.). **A new species of *Kermes* from Connecticut.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 150-151.

A new species of *Kermes*, *K. waldeni*, is described from specimens taken on oak at Portland, Connecticut.

Fink (D. E.). **Ammonia Gas as a Fumigant.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 149-150.

Experiments have been made, and are still being carried on, to ascertain the value of ammonia gas as a fumigant for stored grain. In one experiment six quart bags containing cow peas and living weevils were placed in a fumigation box of $8\frac{2}{3}$ cubic feet capacity; 2 oz. of concentrated ammonia were used, and as a result an average of about 76 per cent. of the weevils were killed. When 3 oz. of ammonia were used, other conditions being the same, 100 per cent. of the weevils were killed. Using 3 oz. of ammonia and 50 lb. bags of grain 75–85 per cent. of the weevils were killed. Experiments were tried with a 100 lb. bag, the amount of ammonia used being increased by 1 oz. per cubic foot, but this failed to give a high mortality.

Chittenden (F. H.). **The Colorado Potato Beetle Migrating to the Pacific Coast.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 152.

Specimens of the Colorado Potato Beetle (*Leptinotarsa decemlineata*, Say) have been found at Colton, Washington; earlier writers stated that the Rocky Mountains afforded an impassable barrier which would prevent these insects from spreading westwards, and it is probable that this case of their occurrence in the West is due to the agency of man.

Peairs (L. M.). **On a Food-Habit of *Alabama argillacea*.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 152-153.

Moths of *Alabama argillacea* were reported as damaging peaches in the autumns of 1911 and 1912 in orchards at Keyser, Mineral County, W. Va. The moths punctured the skin of the ripe fruit and fed on the juice; the injured fruit would be normal in appearance until picked, when it would be found to have soft spots about an inch in diameter surrounding the punctures, rendering it unfit for packing and even for local use. Only the late varieties were injured; in these the damage was as much as 75 per cent.

Peairs (L. M.). *Spilogale* **feeding upon Peach-tree Borer pupae.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 153.

Attention has been called to the value of the common pole-cat (*Spilogale interruptans*) as an insect destroyer. This animal has frequently been observed removing the pupae of the peach-tree borer (*Sanninoidea*) from the soil; on one occasion a pole-cat was observed to go from tree to tree searching for the pupae, which it dug out and devoured.

Newell (W.). **Occurrence of the Argentine Ant in Texas.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 153.

On 5th January 1914 the author found a heavy infestation by *Iridomyrmex humilis*, Mayr, throughout the business and residential sections of Beaumont, Texas. The insect seems to have been established in this locality for the past five years. The occurrence of the ant at this point, on the main line of the Southern Pacific Railway, confirms previous observations that the most rapid dissemination of the insect takes place along the lines of heavy railway traffic.

Ritov (M.). **Новыя средства борьбы съ вредителями плодовыхъ садовъ.** [New remedies against insect-pests of orchards.]—**« Прогрессивное Садоводство и Огородничество.»** [*Progressive Horticulture and Market-Gardening,*] *St. Petersburg*, 18th Jan. 1914, p. 13.

In a short note the author deals with a new insecticide, which is offered by the firm Aug. Linde, Moscow, under the name of "Vegetin." It is claimed that the "carbolineum quite dissolved in water," which forms part of this remedy, supplies to it all its advantageous qualities. According to experiments of Russian phytopathologists, carbolineum has proved useful in a 10 per cent. solution as a remedy against canker, or frost injuries, also against *Lymantria dispar*, Scolytidae and Coccidae when sprayed on leafless plants; but against fungus diseases it has proved ineffective, and besides has caused burning. The author is of opinion that the same effects of carbolineum will appear in Vegetin; besides, this insecticide, as it contains carbolic compounds, requires special and expensive sprayers. The price of Vegetin is about 6*d.* per lb.

Steinberg (P.). **Вредители радиса.** [Insect-pests of radish.] **« Прогрессивное Садоводство и Огородничество.»** [*Progressive Horticulture and Market-gardening,*] *St. Petersburg*, 8th March 1914, pp. 239-240.

The author suggests some methods of dealing with the larvae of *Agriotes segetis*, Bjerk. (Elateridae). As a result of his own observations he is satisfied that the introduction of lime into the soil is a very effective remedy; also a dressing of ashes, or the use of mineral manures generally. Carbon bisulphide proves effective only in friable soil, whereas lime can be applied with success in hard (clay or peat) soils. He recommends the following way of applying potato baits. Large tubers are cut into slices of about half inch thick, two of which are put

together, the inner side of one slice being covered with Schweinfurt green or arsenic ; in order to keep the slices in position they are fastened with wooden pins (matches). These pieces are then buried to a depth of about three to four inches, after the beds are quite ready for sowing. They attract the larvae, which eat into the poisoned slices and perish.

ROLET (A.). **Désinfection des sols par le sulfure de carbone.** [Soil disinfection with carbon bisulphide.]—*Journ. Agric. pratique, Paris,* xxvii, no. 3, 15th Jan. 1914, pp. 89-91.

The use of carbon bisulphide for the disinfection of soils is being more and more widely counselled. In certain cases 176 lb. of carbon bisulphide may be quite sufficient for an acre, but as much as 3,344 lb. has been used. One ton per acre will not injure flowers or vegetables, but expense is a consideration. Light soils are most suited for this method, as in them the fumes spread easily and rapidly, and less bisulphide is required, 1 oz. at a depth of 4 inches being sufficient for a square yard, while in a compact soil 1¼ oz. is necessary. In soils that are too compact or too damp, the chemical is localised too long, and may thus burn plant roots and finally disperse without reaching the noxious organisms. The holes made in such soils should be prepared for the bisulphide by a special boring nozzle fitted on the injector, more of the chemical being required the deeper the holes. The depth should be a little greater than that at which the pest is found, whenever it is possible to locate it. In light, permeable, sandy soils 193 lb. per acre has been used ; in alluvial soil, 20 to 24 inches deep, 264 lb. per acre ; in gravel and stony soil, 12 to 14 inches deep, an average of 193 lb. per acre. Against *Phylloxera* half oz. to about 2 oz. per square yard have been used ; against rot (pourridié) about 7 oz. per square yard, according to Dufour, and about 2½ oz. according to Foëx. In Germany and Holland good results have been attained against the nematodes of the beet with 6 oz. per square yard ; but in France 10 oz. and more have been recommended. Against white grubs 7 oz. per square yard are used. Only the cultivation of flowers and early vegetables can stand the high cost of the large doses to which practice appears to be tending. Thus, 7 to 8 oz. may be injected when dealing with mole crickets injuring cuttings of carnations in boxes. Twenty-five holes per square yard, each taking about one-third oz. are required in this case, which may be considered as a maximum ; for in many instances 3 to 4 oz. are sufficient. If, as is advisable, the operation is repeated at a week's or a fortnight's interval, the 8 oz. dose may be reduced to about 6 oz. On unplanted soil the application of carbon bisulphide is carried out, either in spring or in autumn, a little before sowing or planting. The soil must have settled and must not be too damp, as then the development of gas will be imperfect, or the water will wash the chemical down into the earth where it will be useless. Dry and temperate weather is the best ; hot weather hastens the production of gas. When dealing with planted areas it is well to wait, if a severe frost is expected, as the evaporation of the bisulphide cools the earth. It is generally stated that sowing or planting should be done some 15 or 20 days after treatment and a little nitrate of soda added when the young growths are able to profit by it. However, tomato plants do

not appear to have suffered though planted two days after 7 oz. of bisulphide had been injected in the square yard. Care must be taken not to operate when the trees are in blossom or when the fruits are nearly ripe. E. Wolny states that the introduction of carbon bisulphide into cultivated soil has the effect of either completely or temporarily arresting vegetation and diminishing the production of vegetable matter. It is, therefore, necessary to keep it at a certain distance from the roots. It is said that both plants and pests were destroyed by an injection of 10 oz. per square yard against the nematodes of the beet. Against this, salads are stated to have been scarcely withered at all by a dose of 3 oz., and growing carnations did not suffer from a 7 oz. to 13 oz. dose. It may be accepted that young plants are generally more sensitive. Gastine's injector (pal injecteur) is the instrument used for piercing the holes and injecting the bisulphide. One stroke of the piston rod injects about one-third fluid ounce, which is measured by the d ameter of the pump chamber and the stroke of the piston. By packing in suitable disks the stroke is reduced and doses of four-fifths, three-fifths and two-fifths of the above are obtainable. In all cases about one-tenth of the full one-third fluid ounce remains in the chamber and this must be allowed for by adjusting the capacity to take that amount extra. When the operator is alone he withdraws the instrument and quickly closes the hole with his foot. It is, however, advisable for him to have an assistant to close the hole with a suitable instrument. For large areas a plough, such as that of Vernette of Béziers, is used. The character of the soil not only governs the quantity of bisulphide, but also the number of the holes. These may be comparatively few and far between in the case of light soils in which diffusion is easy. The converse obtains in compact soils, and double the number of holes may be necessary for the same quantity of bisulphide. In dealing with *Phylloxera* four holes, at a distance of about 12 inches from each other, give good results. One man operating alone is able to make 1,000 holes per day, and 3,400 holes may be made if he has an assistant. On the basis of five holes per square yard some 20,000 holes are required per acre and if a man can make about 1,360 holes per day on an average, the acre will require 14 days. Taking wages at about 3*s.* per day, this works out at about £2 per acre for labour. With 8 cwt. of carbon bisulphide per acre at 22*s.* per cwt., the cost per acre works out at about £9 per acre for bisulphide. At the present time the price of bisulphide is higher. The author mentions that for small areas, such as gardens, gelatine capsules containing 2, 3, or more grammes of the chemical may be applied. A pointed stick forms an efficient tool. The mixture of carbon bisulphide fumes with atmospheric air forms a dangerous detonating compound and workmen must not smoke. Flinty soils may cause sparks to fly when the tool is driven in, which is a source of danger. The barrels containing the bisulphide are best stored in an open field with proper protection against the sun. When drawing out some of the liquid it is well to pour in a little water, as this prevents the space left empty from filling with fumes. A greased sounding rod will serve to show how much of the liquid remains in the container, as the grease will be dissolved where wetted by the bisulphide. Empty containers must be left open for a couple of days to permit all traces of bisulphide to evaporate before the bungs are replaced.

Wolff (M.). **Der Kiefernspanner** (*Bupalus piniarius*, **L.**).—*Beiheft zur Zeits. für Forst- und Jagdwesen, Berlin*, 1913, pp. 1-290, 7 pl. 7 figs.

The present work is a detailed monograph on *Bupalus piniarius*, L., the most dreaded of pine moths, written particularly from the point of view of economic forestry, with accounts of the damage it causes, and various methods adopted to combat it. The first part of the work deals entirely with the biology of the moth and contains descriptions of the various stages in its life-history, accounts of experiments and observations made to ascertain the number of eggs laid, the period of development, the proportion of males and females hatching out in different localities, etc., and a discussion of the nomenclature of the species. A chapter deals at some length with the geographical distribution of the species at former times and at present, and an account is given of the conditions which now appear essential to its existence. Species related to *B. piniarius* are referred to, but a detailed account of their life-histories and habits is being kept for a later work. An historical summary is given of the damage that has been reported from various localities since the first time the insect was observed in 1780 to the present day; the pathological effect upon the tree is also discussed. Parasites of the moth are mentioned, but no indication is given of their efficiency in keeping the pest under control. Various methods of combat are discussed, such as collecting the moths, trapping them by illuminants, the use of bird-lime, treating the ground in which the pupae are developing with soap solution, etc.; but these are all regarded by the author as either too costly or inadequate. The method recommended is the raking of the ground below the trees to expose the pupae to dessication and to birds; the soil, consisting chiefly of pine-needles, must be thoroughly well turned over, either with very strong rakes or by means of patent machines described and figured by the author. The book is well illustrated.

Rossikov (K. N.). **Простѣйшій способъ уничтоженія Озимаго Червя или Бабочекъ озимыхъ совокъ.** [The simplest method for the destruction of the caterpillars or moths of *Euxoa segetum*, Schiff., and *Feltia exclamationis*, L.]— **«Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, x, no. 8, 1914, 11 pp.

The author starts with a short record of the outbreaks of these pests during the last few years in parts of Russia which appear to have been previously free from them. In the government of St. Petersburg there was an outbreak about 40 to 50 years ago, and then again last year (1913), when the insects invaded the neighbouring governments of Novgorod, Olonezk, and Pskov; they also devastated the crops in some parts of Siberia, where the author inspected the havoc done by them in the government of Enisseisk and in the provinces of Akmolinsk and Semipalatinsk in 1911 and 1912. He then refers to the principal remedies, dividing them into (1) preventive remedies, such as bare-fallowing the fields and doing away with all strips of waste land; (2) destructive remedies, such as catching the moths on fermen-

ting molasses and using insecticides (Schweinfurt green) against the caterpillars; and (3) protective remedies—trenches with straight walls and about 7 inches deep round the unattacked crops. To these he adds another preventive remedy which has been investigated by him in 1913 and gave better results than bare fallow; this he calls "occupied fallow" (a note announces that a special pamphlet will be published on the subject). These remedies are applied in Russia only on large estates and chiefly in the south-western governments; in all other parts of Russia they are seldom used, owing to lack of means and to the fact that it is not practicable to leave land fallow under the existing conditions of agriculture. The author has satisfied himself that these insects can be successfully controlled by the simple method of collecting the moths by hand. He observed that during the time when the moths of *E. segetum* and *F. exclamationis* were on the wing, and especially during their maximum period between the 10th and 21st July, they congregated every evening between 9.30 and 10.30 p.m. on rye plants, being almost entirely confined to the edges of the fields and principally where these adjoined fallow-land; the strip of the rye upon which the moths occurred was not broader than 3½ feet. The females appear first and sit motionless, while the males arrive somewhat later and are more active; the females could be examined by the light of an acetylene lantern and even touched with the hands without any resistance on their part. Seeing that each female may lay up to 1500 eggs, the collection of the moths may have important practical results.

The author concludes by mentioning some other pests which can also be easily collected by hand at the same time:—*Barathra* (*Mamestra*) *brassicae*, *Acronyta psi*, *A. rumicis*, *Trachea* (*Hadena*) *basilinea*, *Euxoa corticea*, *E. nigricans*, *Plusia gamma* and others.

Dobrodeev (A. I.). **Дымъ вообще и табачный дымъ въ частности, какъ средство борьбы съ яблонной медяницей.** [Smoke generally and Tobacco-Smoke in particular as a remedy against *Psylla mali.*] — **«Труды Бюро по Энтомологiи Ученаго Комитета Глав. Управ. 3. и 3.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, x, no. 9, 1914, 20 pp.

The author gives an account of his experiments on the fighting of *Psylla mali* by means of tobacco-smoke and smoke from burning straw, which were conducted in an orchard in the government of Penza. He starts with a general review of the life-history of the pest and of the remedies usually employed. Portchinsky and Gaike have both simultaneously recorded the favourable results which may be obtained by using tobacco smoke, and the author has himself shown this remedy to be very successful, both in the field and in the laboratory, but the following conditions must be adhered to. The fumigating must be done at the time when the pests are on the wing, but before they have oviposited; the smoke must closely fill the whole tree for at least for one hour; the fumigating must be started along the borders of the orchard, so as to prevent the escape of the insects; it must be done in calm weather, after rain, as dry air allows the smoke to rise rapidly without affecting all parts of the tree; care must be taken

that there should be no branches hanging directly over the burning heaps. Straw smoke proved less effective and can be recommended only as a means of driving away the pests ; this may be useful only in cases where there are in the neighbourhood of the particular orchard some other trees (apple or Sorbus) on which the insects can oviposit, otherwise they may merely return after the fumigation is over.

The author deals also with tobacco smoke as a remedy against *Psylla pyri* and Aphids, and refers to statements of Professor Glasenapp, F. V. Theobald and others. The use of this remedy in Russia may be affected by the price of tobacco dust, which varies in different governments, depending on freight rates and other conditions. He quotes a few examples of prices, and it appears that while, for instance, the price of tobacco dust in the government of Saratov is about $7\frac{1}{2}$d. per 36 lb., in the government of Kaluga it is about 1s. 3d. for the same amount, and in the government of Penza about 10d. Should the price, and especially the railway freight, be reduced, it may take a prominent part as an insecticide in Russia.

VASSILIEV (I. V.) **Краткія свѣдѣнія о хлѣбномъ жукѣ и способы борьбы съ нимъ.** [Short notes on *Anisoplia austriaca*, Herbst, and methods of fighting it.]—**«Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. 3. и 3.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, vii, no. 2. Second, enlarged edition, 1914, 36 pp., 20 figs., 2 col. plates.

The author begins by describing all the stages of *A. austriaca*, which is the most injurious representative of the genus *Anisoplia*. This insect is found in the greater part of the southern half of the "tchernosiom" district of Russia and a list is given of the governments in which it is known. Outside Russia it is found in Austria-Hungary, in the Balkan peninsula, in Syria and in Asia Minor. Upon the emergence of the beetles in spring their food consists at first of various grasses, such as *Triticum repens* and *Phleum pratense*, from which they pass on to rye, and after this has been harvested, to winter wheat and barley and lastly to summer wheat, on which they remain till their disappearance in the first half of August. For oviposition the insects select soft soil, and usually keep round the borders of the field, while the central part is sometimes not affected at all. The number of eggs laid by a female is on the average 30–40, although Jaroshevsky reports that under favourable conditions a female may lay up to 48 eggs, which figure is, according to the author's observations, sometimes increased to 58. The larvae live in the soil for about 22 months, and the pupal stage lasts about three weeks. The beetle itself attacks chiefly rye, wheat and barley at the time when the grain is still soft, gnawing the seeds and sometimes devouring them entirely. Moreover, it causes much loss by creeping over the ears and shaking out the mature grain.

The whole cycle of development of *A. austriaca* requires two years, the imago appearing in large numbers in alternate years ; so that outbreaks, which are due to some specially favourable conditions, recur after an even number of years.

There are three species of parasitic wasps of the family SCOLIIDAE which attack the larvae of this beetle :—*Tiphia femorata*, F., *T. morio*, F., and *Scolia quadripunctata*, F.

*Tiphia femorata*, of which the various stages are described, attacks exclusively the large one-year-old larvae of the *Anisoplia*, in search of which it penetrates into the soil. The parasite paralyses the larva with its sting, and then deposits its egg on the ventral side of the central segments of the body. This egg produces a larva in about a week, which feeds on its host externally. The development of the parasitic larva is concluded in about $1\frac{1}{2}$–2 weeks, when it enters the hollow skin of its victim and pupates there, passing the winter in this stage. The number of larvae infected by this parasite is not great, about 6–12 per cent. according to some investigations by Portchinsky in 1879 ; in 1905, the author found 14 per cent. of the larvae affected in some spots, but the figure never exceeded 20 per cent. The same insect parasitises also the larvae of *Amphimalus solstitialis*, *Polyphylla fullo*, *Epicometis hirtella* and insects of the genus *Aphodius*. The habits of *Tiphia morio*, which parasitises *A. austriaca* and *Amphimallus solstitialis*, are similar to that of *T. femorata*. According to Wiedhalm *T. morio* produces two generations during one summer, while Rossikov is of opinion that the same may be the case also with *T. femorata*.

*Scolia quadripunctata* has been recorded by Portchinsky as a parasite of *A. austriaca*, and also parasitises *Oxythyrea stictica*, but its biology has not yet been investigated. Apart from the above parasites, the larvae of *A. austriaca* are also attacked by the larvae of *Microphthalma disjuncta*, Wied., a Tachinid fly of the subfamily DEXINAE, which destroy chiefly the larvae of *Melolontha hippocastani*, *Amphimalus solstitialis* and *Polyphylla fullo*. A description is given of the various stages of this fly, which has two generations in South Russia, the second one hibernating in its larval stage inside the body of the host. According to Krassiltchik this parasite develops very rapidly and devours the host in a few days.

The larvae of *A. austriaca* are subject to the attacks of a nematode worm, *Leptodera dentata*, and also become infected with flacherie and a fungus disease due to *Entomophthora anisopliae*. In 1902, near Kishinev, this disease caused the death of 60–70 per cent. of the larvae of *A. austriaca*.

The author proceeds to deal with control measures against *Anisoplia*, describing first the digging operations which must be conducted in order to estimate the intensity of infestation. These must be carried out during the second half of the summer, after the harvest, till late in autumn, when the frosts begin. The digging ought to be done in plots which were occupied during the summer by grain crops, especially by wheat and rye ; also in fields left fallow during the previous season, which have been ploughed up for crops other than grain ; and neighbouring meadows and other soft soil should also be investigated. The operations can be limited to a strip of some 25–35 yards round the fields, the procedure being to dig holes of a standard size in various spots and then to estimate the total number of larvae in the contained soil, as well as the numbers of those that are diseased, or suffering from parasites, etc. The results obtained by these investigations ought to be checked by renewed investigations in the following spring,

in order to find out the progress of diseases, etc., during the winter. Should these investigations prove that an outbreak may be expected, the preventive measures recommended are, to decrease the area of crops, such as wheat, barley, and especially summer wheat, and to harvest the grain as early as possible. As the insects attack principally the edges of a crop, it is suggested that the fields be made square, rather than long parallelograms, in order to reduce the length of the margin to a minimum.

The following destructive remedies are suggested :—Trap crops of wheat and rye, and also maize, the soil under which is preferred by the pests for oviposition. These fields must be sown before the outbreak has really started, and the beetles which concentrate on them can be collected by hand, while the eggs can be destroyed later by reploughing. Reploughing is also recommended for the destruction of pupae, in spots where investigations have shown the presence of large numbers of larvae. As pupation takes place after May, the ploughing must not be done before the middle of that month, but it must be finished by the first half of June. The insects may also be driven to one side of the field by drawing heavy ropes across it, and they can then be collected into sacks and destroyed. This must be done at the hottest time of the day, when the beetles are more easily driven down the wind ; if there is no wind or if the wind is too strong, this remedy becomes impracticable.

In South and Middle Russia there are additional species of *Anisoplia*, such as *A. cyathigera*, Scop., *A. segetum*, Herbst, and others which are less injurious. *A. cyathigera* occurs over a larger area than *A. austriaca*, being found as far north as the governments of Tula and Kazan ; while *A. segetum* ranges from the government of Kurland in the west to the government of Simbirsk in the east. They usually appear earlier than *A. austriaca*. *A. cyathigera* injures grain in the same manner as the latter species, and as its habits are similar, the remedies recommended may prove effective against this pest as well. The damage done by *A. segetum* is not very serious, consisting chiefly in the destruction of the inflorescence of the grain. It disappears from the field sometimes even before the end of July.

A synoptical table to facilitate the identification of the various species of *Anisoplia*, another giving the distinctive characters of the commoner Lamellicorn larvae found in the soil, and two coloured plates, are appended.

RABINOVICH (A.). **Простое средство противъ ленки.** [A simple remedy against *Epicometis hirtella*, L.]—**« Прогрессивное Садоводство и Огородничество.»** [*Progressive Horticulture and Market-Gardening.*] *St. Petersburg*, no. 5, 15th Feb. 1914, pp. 137-138.

The author gives an account of a remedy against *Epicometis hirtella*, L. (*Tropinota hirta*, Poda) which he has successfully applied during the last 8–10 years and by means of which he has been able to keep the insect entirely under control. The remedy consists in spraying lilac bushes, which are found in nearly every garden and which blossom at a later date than fruit trees. The insects, after the blossoming of the apple trees is over, pass on to the lilac, on which they feed very freely, and by spraying these bushes at the time of their blossoming

with Paris green or Djipsin of a double strength it is possible to destroy practically all of them, except those which arrive later from neighbouring gardens where no remedies are used, or from the open fields.

Vassiliev (Eug. M). **Дополненіе (І-ое) къ ,,Списку животныхъ вредителей люцерны.''** [First supplement to "The List of Animal Pests of Lucerne."]—**«Хозяйство»** [*Agriculture*], *Kiev*, no. 6, 26th Feb. 1914, pp. 189-193. (From the Myco-Entomological Experimental Station of the All-Russian Society of Sugar-Refiners in Smiela, Govt. of Kiev.)

For the original list, to which this is supplement, see this *Review*, Ser. A. i, p. 526. The following species are now added.

Coleoptera: The sprouts of lucerne are injured by larvae of *Leptosonyx typhoides*, Dalm., a Chrysomelid. An outbreak occurred in the government of Astrachan in 1912, where the larvae also damaged vetches, lentils and wild steppe plants. The insect is known only from South Russia and has been very little studied. *Plagionotus* (*Clytus*) *floralis*, Pall., this Longicorn has been recorded by Paczoski as a pest of lucerne in some parts of the government of Taurida. *Hypera* (*Phytonomus*) *denominanda*, Cap., although known in Austria-Hungary, Germany, Turkey and Caucasia, is not reported as injurious, but according to Demokidov it injures the leaves of lucerne in Turkestan (1906). The following information is supplied by this author: the weevils winter on the surface of the earth among the upper roots of lucerne or under dry grass; early in spring they feed on the leaves and oviposit on the plant; the larva gnaws long holes in the leaves and after 3–4 weeks pupates on a folded leaf in a white transparent cocoon; in about 4–5 days the beetle emerges, and lives for some time on the lucerne before hibernating. *Calosoma* and its larvae and some parasites are mentioned as enemies of this pest. The following remedies are suggested: spraying in spring with Schweinfurt green (4·8—6 drams of green and double this amount of freshly slacked lime in about 2·7 gallons of water), or with barium chloride (4·5—7 oz. in 2·7 gallons of water); dusting with a powder of freshly slacked lime (after rain or dew) by means of "Torpille" bellows; and the early cutting of lucerne as a means of destroying the larvae as well as the eggs.

Homoptera: *Acocephalus rusticus*, F., is reported by Paczoski to have injured lucerne in the government of Cherson in 1913.

Lepidoptera:—*Chloridea obsoleta*, F., was reported in 1911 from Turkestan, where its caterpillars injured the leaves of lucerne, cotton seeds, maize, and tomatoes. *Laphygma exigua*, Hb., also reported in 1911 as attacking lucerne in Turkestan. In the same year the caterpillars of this pest appeared in the government of Astrachan on lucerne, but they were not noticed again in 1912. *Eubolia arenacearia*, Hb., also reported in 1911 as attacking lucerne in Turkestan. In the same year the caterpillars of this pest appeared in the government of Astrachan on lucerne, but they were not noticed again in 1912.

Diptera: *Perrisia onobruchidis*, Bremi; the author refers to Prof. Kirchner, who mentions this Cecidomyid amongst the pests of lucerne in the first edition of his book, although it is omitted in the

second. According to Keppen, this pest was reported from the government of Charkov in 1882 on sainfoin crops, having been identified by Portchinsky; besides sainfoin, the larvae attacked lucerne (*Medicago falcata*), *Melilotus officinalis*, Desr., *M. macrorrhizus*, Pers., and *M. albus*, L.

STCHERBAKOV (Th.). **О паразитахъ-яйцеѣдахъ плодожорки и о работахъ надъ ними А. Радецкаго.** [On the parasites of the eggs of *Cydia pomonella* and the investigation of them by A. Radetzky.]—Reprint from **Записки Симферопольскаго Отдѣла Императ. Росс. Общ. Садоводства.** [*Memoirs of the Simferopol Branch of the Imperial Russian Society of Horticulture*], *Simferopol*, no. 140, 1914, 12 pp.

The author refers to the papers by A. Radetzky on his importation of the parasites of the eggs of *Cydia* (*Carpocapsa*) *pomonella* from Astrachan to Turkestan, and points out that at the First Russian Conference of Entomologists in Kiev, in August of last year (1913), the work of Radetzky was severely criticised. The latter stated that he had imported into Turkestan the parasite known as *Trichogramma* (*Oophthora, Pentathron*) *semblidis*, Auriv., but owing to some doubts as to the exact identification of the parasites found in that country, he gave to it the name of *Trichogramma* (*Pentarthron*) *carpocapsae*, Ashm. When he sent his specimens to Russia, the Russian entomologists were not able to discover amongst them either of these two species, but identified them as *Trichogramma fasciatum*, Perkins. Thus the exact name of the parasite and the number of species imported by Radetzky is not known, though this is a matter of great importance, so far as their usefulness, etc., is concerned. The author further doubts the statement of Radetzky that there are no local species parasitic on *C. pomonella* in Turkestan, for a species has been found by Plotnikov in Fergana, where no parasites have been imported; nor does he accept the contention that *C. pomonella* was absent from Turkestan till it was imported by the Russians after the conquest.

UMNOV (A.). **Отчетъ о дѣятельности Калужскаго Энтомологическаго Бюро за 1913 годъ.** [Report on the work of the Entomological Bureau of the Zemstvo of Kaluga for the year 1913], *Kaluga*, 1913, 36 pp.

The Entomological Bureau in Kaluga came into existence at the beginning of last summer and this is a report on the first half-year's work. Attention has principally been paid to pests of orchards, as these constitute an important industry in the government, covering nearly 16,200 acres. Most of these orchards are in a very unsatisfactory state, and the Bureau had to undertake the task of teaching the population the necessity for proper cultural methods, as well as measures for controlling the various insect pests, which have yearly levied a heavy toll. The report goes on to describe the campaign conducted by its staff on two areas, one in the district of Mestchovsk and the other in the district of Kozelsk.

*Aporia crataegi*, L. The larvae of this butterfly started emerging from their winter nests in the first half of April and attacked the young buds. The destruction of the nests, cleansing of the stems and the

application of tanglefoot belts were immediately initiated; belts were put on 7,000 trees in one district and on 3,500 trees in the other. Before the blossoming of the trees spraying was proceeded with and a total of 24,300 acres in both localities was sprayed with Paris green. After the 21st May the first pupae appeared, which gave a new generation from the 2nd June, but the number of butterflies on the wing was not great. The first eggs were found on the 17th June, the caterpillars emerged after the 6th July, while after the 25th August the first winter nests were noticed. The results of the campaign are considered satisfactory and only those orchards suffered great damage the proprietors of which applied no remedies, these being stripped quite bare of leaves. In all the other orchards the harvest was small, and sometimes bad, but the trees produced leaves.

*Psylla mali*, Först. The hatching of the larvae started on the 19th April and on the 23rd they were already inside the buds, which later on were entirely covered with the pests. The imagos appeared on the 23rd May, and large numbers of eggs could be found at the end of August. The usual remedy of spraying with quassia and green soap was applied, but owing to the large area to be treated this remedy could not be completed in time, i.e., before the larvae entered the buds. If applied in time it gave excellent results. The spraying with insecticides in old orchards was rendered ineffective owing to the close planting of the trees, coupled with their thick crowns. Fumigating with tobacco was also applied during the time when the insects were on the wing—for two to three months from the end of May—which always gave excellent results. The only drawback to this remedy is that it destroys the pests after they have already caused much damage in their larval stage, but it frees the orchards from them for the next year.

*Aphis pomi*, de G., was found in young orchards (5–8 years old) and in nurseries. Spraying with quassia was very effective. The hatching of the lice started on the 21st April; the first nymphs were noticed about a fortnight afterwards; the first winged specimens appeared on the 17th May; in the first half of September plenty of eggs were found. *Aphis sorbi* Kalt. was found in both localities.

*Anthonomus pomorum*, L., was found in orchards everywhere; but owing to the feeble blossoming of the trees its injurious activity was not great. The hibernating weevils appeared after the 11th April; larvae were found in the buds after the 12th May they pupated from the 26th May and produced imagines from the 17th June. A table showing the results of shaking the insects from the trees is given, from which it appears that 211 beetles were obtained in this way from 33 apple trees; on the same trees 73 beetles were collected on the sticky belts. Spraying with lime in the orchards, where the short spring allowed of this remedy, proved successful.

*Cydia pomonella*, L., was observed in every bearing orchard. The caterpillars of *Malacosoma neustria*, L., appeared only in small numbers and no special remedies were applied. Nests of *Hyponomeuta malinellus*, Z., to the number of from 2 to 5 were noticed on trees from the first half of June to the beginning of July. The insects were found everywhere, but not in great numbers. *Euproctis chrysorrhoea* was seldom found.

The report further refers to the spraying of the trees with sulphate of iron, which had for its object the removal of the moss, lichen, etc., and gives a general review of the results of the campaign. The pests mentioned above were found also in other parts of the government outside the two districts specially dealt with. From the town of Kaluga *Byturus tomentosus*, F., and *Cossus cossus*, L., were reported. The caterpillars of the latter were found in poplar trees between the 14th August and the 19th September; the first pupation took place on the 23rd August.

As to the pests of field crops, chief amongst them were *Agriotes lineatus*, L., and *Euxoa segetum*, Schiff. The larvae of *A. lineatus* caused great injury to some fields in the district of Kozelsk, during the autumn of 1912. Investigation conducted on the same fields in April 1913 again showed their presence. In order to ascertain the degree of the infestation samples of the soil were taken out and carefully examined by screening, the soil having previously being made friable; for each sample a clod of earth about 1½ feet square and about 10½ inches thick was dug out from each dessiatine (2·7 acres); these samples showed an average presence of 20,000 larvae per acre. Two kinds of remedies were tried; potato baits poisoned with Schweinfurt green, and suffocating with carbon bisulphide ($CS_2$). The first experiment was conducted in the following way: slices of potatoes were put into a solution of 1 per cent. Schweinfurt green in sal ammoniac and left there for about 24 hours; the potatoes were then left in the open air till the smell of ammonia was lost, after which they were set in trap holes of about 8 inches square and 9 inches deep, which were covered with boards. Such holes were dug at a distance of 20 paces one from another round the attacked spots. Only a few specimens of dead larvae were discovered later in these traps, but in the soil round them more larvae, motionless, and of a peculiar blueish brown colour were found; of 48 such larvae which were put into a glass with earth and food, 32 perished in about 10 days, *i.e.* 66½ per cent. Evidently the larvae had left the holes after having eaten the poisoned baits. Details are given of an experiment with carbon bisulphide; but the percentage of larvae killed was only 32·1 per cent. and 38·3 per cent. Owing to the cost of this remedy it is not considered possible to increase the amount of $CS_2$, but evidently the time during which it remained in the earth was not sufficient to permit of complete diffusion in that particular soil.

*Agriotes* larvae also injured various winter-sown fields in September. A part of one field manured with superphosphate was injured, while a neighbouring part manured with basic slag was not attacked by the pests. According to the proprietor of the field, the larvae last year also attacked a part manured with basic slag, when the latter was scattered about the field; while this year the method of manuring was to lay the slag in regular lines. As a rule, crops manured during the summer with dung were able to withstand the attacks of the wireworms, although there were large larvae in the earth of such fields; evidently the dung caused a strong and rapid growth of the plants It is also reported that on one field, part of which was sown with grain (rye) disinfected with formalin, owing to its suffering from a fungus disease (*Tilletia secalis*, Kuhn), the crop was very heavy; while on the other part, where no such process was applied to the sown grain

the plants were injured by the larvae. The author is not inclined to explain this as due to the influence of the formalin alone.

Experiments conducted in the laboratory on the food of the larvae showed that they preferred cucumbers, beetroots and carrots ; the next place being taken by potatoes, while they ate turnips very unwillingly and did not touch radish. Cannibalism was also observed.

*Euxoa segetum* was present in the government, but not to a serious extent. The following species are also recorded : *Feltia* (*Agrotis*) *exclamationis*, L., *Ochsenheimeria taurella*, Schiff., an unidentified species of Thrips, *Siphonophora cerealis*, Kalt., *Phyllotreta vittula*, Redt., and *Athous niger*, L.

DINDON (P.). **Къ борьбѣ съ капустной мухой.** [On the fight against *Chortophila* (*Anthomyia*) *brassicae.*]—**« Садоводъ »** [*The Horticulturist*], *Rostov-on-Don*, no. 2, Feb. 1914, pp. 111-113, 2 figs.

The author gives some information as to the life-history of this fly. The larvae attack the young stalk and collar of cabbages, causing the plants to fall over. The imago appears early in spring and oviposits on the stalks of the plants, near the earth, the eggs hatching in about ten days. The larvae pupate in the earth and produce a second generation in June–July. The duration of the whole development of the insect is about $1\frac{1}{2}$–2 months, so that they can produce two to three generations during one summer. The females prefer to oviposit on dung, so that plants manured with poudrette or fresh dung or similar manure are more liable to attack, while the damage done by the pests is less in fields manured with compost or some other artificial manure. The most radical remedy is to take out the injured plants and to destroy them, together with the larvae, by burning. As a preventive measure the author suggests spraying the plants with milk of lime (1–2 lb. lime in about 2·7 gallons of water), but this remedy is effective only for a short time. Good results can also be obtained by rubbing the collar of the plants between the fingers, which operation prevents the hatching out of the larvae, this must be repeated every ten days and at the same time the earth round the plants must be sprayed with milk of lime or simply with dry lime (about 1 cwt. to the acre). The author records the results of the following method applied to two fields of cabbage during last year. Both fields were manured only with mineral manure, such as basic slag, potash, etc., besides having been limed in the previous autumn. The first field was also twice reploughed during the autumn and twice harrowed in the following spring. The second field was only once reploughed in autumn. The rubbing of the stalks was only once undertaken and no liming was applied afterwards. The results were that on the first field only 5–8 per cent. of the plants fell out, whilst on the second one this figure reached 20 per cent.

STCHERBAKOV (Th.). **Замѣтки по фаунѣ уховертокъ, трипсовъ и сѣтчатокрылыхъ Россiйской Имперiи.** [Notes on the Dermaptera, Thysanoptera and Neuroptera of the Russian Empire.]—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 3-4, 1913, pp. 461-466.

The following species of Thysanoptera are recorded by the author.

*Haplothrips aculeatus*, F., *Aeolothrips fasciatus*, L., and *Limothrips denticornis*, Hal., found in 1912 on tobacco leaves in the government of Tchernigov by Miss A. Bragin. The author is of opinion that both species were swept by the wind on to the tobacco and perished on the sticky surface of the latter ; he does not consider it in any way probable that they feed on tobacco. *Scolothrips sexmaculatus*, Pergande, found by F. Zaitzev near Tiflis in 1912. This is the first time that this species has been reported in Russia, as up till now it has been known only from the United States, according to Moulton and Qualey ; it is probable that it has been imported into Russia from the cotton plantations of North America. *Physothrips atratus*, Hal., and *Frankliniella tenuicornis*, Uz., found on tobacco in the government of Tchernigov in 1912 by Miss A. Bragin. *Drepanothrips viticola*, Mokrz., found by Mokrzecki in 1901 near Novorossiisk, is injurious to vines, causing red spots to appear on them. The females winter underneath the bark and appear on the leaves in April. *Heliothrips haemorrhoidalis*, Bouché—found by Mokrzecki in 1912 on leaves of *Viburnum* sp. in Suchum, in the garden of the Experimental Station.

Pospielov (W.). **Versuche künstlicher Infizierung der Wintersaateule (*Agrotis segetum*, Schiff.) mit parasitischen Hymenopteren.** [Experiments on the artificial infection of *Agrotis segetum*, Schiff., with parasitic Hymenoptera.]—*Zeits. wissen. Insektenbiol., Berlin*, x, no. 2, 15th Feb. 1914, pp. 52-58.

This is practically a translation of the paper abstracted in this *Review*, Ser. A. i, p. 539.

Friederichs (K.). **Ueber *Adoretus vestitus* Boh. als Schädling in Samoa und seine früheren Stände.** [*Adoretus vestitus*, Boh., as a pest in Samoa, and its previous significance.]—*Zeits. wissen. Insektenbiol., Berlin*, x, no. 2, 15th Feb. 1914, pp. 41-47, 6 figs.

This *Adoretus* has been known for some time past in Samoa as the Rose Beetle, from its principal food-plant. Until recently it has not been regarded as a pest, but now it has taken to feeding on cacao, and its depredations may probably become serious. The author believes it to be also the cause of damage observed on Liberian coffee ; species of the same genus are recognised pests of coffee and cacao in Java. The beetle hides during the day, and feeds at night, being attracted by light. It occurs all the year round. Little is known of its life-history, but it is surmised that breeding takes place at all times of the year, since larvae are always to be found among the roots of grasses or other plants ; these larvae are not known to do any damage. It seems that the cacao trees most liable to be attacked are those which are unprotected by larger trees, and which stand more or less alone. Combating the beetle is a matter of some difficulty, mechanical and chemical methods which have been tried having proved of little use ; in the case of spraying (nature of spray not stated), the beetle was destroyed, but the leaves of the plant were badly damaged. No natural enemies which would keep the beetle quite under control are known in the vicinity where the damage is done, but the author suggests that, were they introduced, the enemies which he has advocated for use against the rhinoceros beetle (*Oryctes rhinoceros*, L.)

would prove efficient. [See this *Review*, Ser. A, ii, p. 26.] As regards fungus diseases, infections with green muscardine have so far not been successful. A description of the species is given.

Chadwick (C. J.). **White Ants on Coconuts.**—*Trop. Agric., Peradeniya,* xlii, no. 2, Feb. 1914, p, 96.

The author in reply to Mr. Krishnaswami Row, regarding the ravages caused by white ants in a young coconut plantation, suggests the use of a mixture of 1 lb. crude perchloride of mercury and 10 gallons of water, the soil surrounding the young palms to be saturated with this solution. This works satisfactorily in the case of a rubber plantation. It has been found that the best situation for a coconut plantation is near the sea or along the banks of a river where the soil is well drained and supplied with moisture throughout the year. According to Mr. W. W. Froggat a few pounds of kainit dug in about the roots of fruit trees will drive away white ants. [See this *Review*, Ser. A. i, p. 513.]

Martelli (G.) **Il** *Tetranychus telarius*, L., **provoca agli Agrumi la così detta Ruggia rossa.** [*Tetranychus telarius*, L., the cause of the so-called red rust on citrus trees.]—*Giorn. Agric. Merid., Messina,* vii, nos. 1-2, Jan.-Feb. 1914, pp. 7-10.

Many lime trees were almost completely defoliated in parts of the provinces of Messina and Catania during June and July, 1912. The upper side of the leaves showed yellow patches and the corresponding places on the under side were reddish. The fruit was spotted with brownish red. Among the growers this was known as red rust. The author states, as the result of careful experiments, that the injured leaves and fruit harbour *Tetranychus telarius*, L., and this mite is responsible for the discoloration.

Martelli (G.). **Sulla Bianca-rossa.** [Concerning *Chrysomphalus.*]—*Giorn. Agric. Merid., Messina,* vii, nos. 1-2, Jan.-Feb. 1914, pp. 28-29.

In a reply to a correspondent the following data are given : (1) Six hundred large lime trees infested with *Chrysomphalus* require 70 pints of concentrated polysulphide (density 25° B.) 5 per cent. solution per tree per application, or 2,100 pints of concentrated polysulphide weighing 2,860 lb. ; as three applications are necessary, the total weight would be 8,580 lb. (2) The number of applications may be reduced to two, with a corresponding reduction in the amount of insecticide, but in that case an operator must spray the top of the tree from a high ladder. (3) A single application of 20 per cent. solution in winter is not sufficient ; two applications are required and they must be carried out as stated. Furthermore, the neighbouring plantations must be either clean or under similar control measures. The effects of the treatment will last for two years, if not longer, and no spraying will be required during that period.

GREEN (E. E.). **On some Coccid pests from the Seychelles.**—*Jl. Econ. Biol., London,* ix, no. 1, March 1914, pp. 47-48.

A small collection of insect pests, received from Mr. R. Dupont, Superintendent of Botanic Gardens, Seychelles, contained the following species of COCCIDAE :—*Aspidiotus ficus*, Ashm., taken on leaves of *Zamia* sp., an ornamental Cycad cultivated in tropical gardens; *A. bromeliae*, Newst., on leaves of the Pineapple, a serious pest, probably imported from the Canary Islands; *Coccus* (*Lecanium*) *hesperidum*, Auct., and *Eucalymnatus* (*L.*) *tessellatus*, Sign., on leaves of the Water Hyacinth; these insects may be regarded as beneficial, since the excessive growth of this plant blocks the waterways; *Saissetia* (*L.*) *hemisphaerica*, Targ., on leaves of *Justicia gendarussa*, an ornamental plant which seems particularly liable to Coccid infestation.

PICARD (F.). **Les champignons parasites des insectes et leur utilisation agricole.** [Fungi parasitic on insects, and their utilisation in agriculture.]—*Ann. Ecole Nat. d'Agric., Montpellier,* xiii, no. 2-3, 1914, pp. 121-248, 28 figs.

The present paper is a comprehensive account of the different species of fungi which are parasitic on insects; the author merely refers to those which live on insects either symbiotically or which only cause slight harm to them, and confines his descriptions to the species which are really detrimental to the host, and which may possibly be of use in agriculture in combating insect pests. The descriptions are written more from the point of view of the zoologist and agriculturist than from that of the mycologist. The species of fungi dealt with are arranged according to their systematic order. In the group of Oomycetes, the family ENTOMOPHTHORIDAE is the only one containing species harmful to insects, notably the genus *Empusa*. Of the Ascomycetes the following groups are described :—Laboulbeniaceae, Spheriaceae, Nectriaceae, and Perisporiaceae; a large section of the paper deals with the important group of Hyphomycetes, which includes many species that kill insects.

Harmful parasitic fungi react on their hosts in various ways; in the case of the Laboulbeniaceae, the fungus gets its nourishment from the tegument of the host, without seriously damaging the body or injecting the toxic substances into the system of the host. Others, more harmful, pierce the chitin and destroy the layers of adipose tissue lying below. Still more harmful are those whose mycelium branches in the body of the host, filling up the tracheae and causing suffocation, as does *Fusarium* in the case of certain *Acaridae*. The ENTOMOPHTHORIDAE and VERTICILLIACEAE kill their hosts by sending out filaments which penetrate all the tissues, destroying these and replacing them with a secretion, so that the insect becomes mummified; muscardine diseases work in this way. Sometimes the body of the host is entirely disintegrated, as is the case with Coccids parasitised by the Ascomycete *Myriangium duriei*. The modes of infection and the degrees of virulence of the diseases are discussed at some length, and a comprehensive bibliography is given.

A section of the paper deals with the economic significance of fungi as killers of insects. The accounts of experiments given show that

attempts to combat pests by the introduction of fungus diseases have so far not been very successful; and the author appears to think that while these diseases can be artificially increased where they already exist, yet it is not likely that they can be established in places where they do not occur naturally.

Noel (P.) **Les Insects et les Acariens nuisibles aux plantes cultivées en France.** [Insects and mites harmful to cultivated plants in France.]—*Bull. Trim. Lab. Rég. d'Entom. Agric. Seine-Infér., Rouen*, Jan.-March, 1914, pp. 3-11.

The writer gives tables showing the particular orders of insects and the number of species attacking each of the 286 cultivated plants of France. The 16 cultivated fruit trees are attacked by 1,671 different kinds of insects; 28 market garden plants by 704 species; 31 forage plants and cereals by 988 species, and so forth.

Noel (P.). **Les Ennemis des Salsifs.** [Enemies of salsify.]—*Bull. Trim. Lab. Rég. d'Entom. Agric., Seine-Infér., Rouen*, Jan.-March 1914, pp. 11-12.

The following insects are given as the chief pests of salsify:—*Cassida thoracica*, Klug; *Aphis papaveris*, F., which sucks the juice of the leaves in June; *Aulax scorzonerae*, Giraud; *Scotogramma trifolii*, Rott. (*Mamestra chenopodii*, Schiff.), the caterpillars of which destroy the leaves from July to October; and a Cecidomyid.

Aulmann (G.). **Ein neuer Schädling an Kokospalmen auf Samoa.** [A new pest of coconut palms in Samoa.]—*Entom. Rundschau, Berlin*, xxxi, no. 5, 14th March 1914, pp. 31-32, 3 figs.

A new Hispid beetle is described under the name of *Promecotheca lindingeri*, Aulm., as a pest of coconut palms in Samoa. The eggs are deposited on the under side of the leaf, and the larvae make long mines in the parenchyma, causing the leaf to die. The damage done by the imago is quite different; it settles on the upper surface of the leaf and eats away the tissues from the outside in parallel lines, which also kills the leaf.

Lyle (G. T.) **Contributions to our knowledge of the British** *Braconidae*, **No. 1.** *Meteoridae.—Entomologist, London*, xlvii, Mar. 1914, pp. 73-77, 1 pl.

During the past ten years the author has given considerable attention to the study of hymenopterous parasites, their breeding habits and life-histories. The present paper, which is the first of a series describing the results of this work, deals with the British species of the Meteorinae; the British species of this family are all referable to the genus *Meteorus*, of which six species are described. *M. albiditarsis* was bred from a larva of *Taeniocampa miniosa*, and also from larvae of *T. gracilis*, *T. pulverulenta*, *T. stabilis*, and *Panolis piniperda*. *M. chrysophthalmus* was bred from larvae of Geometridae. *M. ictericus* was bred from larvae of Tortrices, taken from oak trees. *M. atrator* was captured, together with specimens of the hyperparasite *Hemiteles areator*, running about on furniture which was infested with the moth *Tinea bisselliella*, evidently searching for the lepidopteron.

Theobald (F. V.). **Additions to the list of Kent** *Aphididae.—Entomologist, London,* xlvii, Mar. 1914, pp. 100-104.

A list is given of Aphides not previously recorded for Kent, including a few new to British fauna; the list includes 12 genera and about 40 species. The most abundant and harmful species in 1913 was *Aphis sorbi*, which did great damage to the apple crop; next in importance was *A. abietina*, on spruces, causing in many cases complete defoliation.

Felt (E. P.). *Diadiplosis coccidivora*, **sp. n.**.—*Entomologist, London,* xlvii, Mar. 1914, pp. 86.

A description is given of a new species of midge, *Diadiplosis coccidivora*, reared in some numbers from a species of *Pseudococcus* by A. Rutherford in Ceylon. It appears to be related to *D. cocci* which preys upon the eggs of the black scale, *Saissetia nigra*, though differences may be great enough to warrant placing it in a separate genus.

Howlett (F. M.). **A trap for Thrips.**—*Jl. Econ. Biol., London,* ix, no. 1, Mar. 1914, pp. 21-23.

The author gives the results of experiments made to test the degree of attraction of certain chemical substances for flower-haunting insects. Three of the substances tried were found to have a marked attraction for Thrips, namely benzaldehyde, cinnamylaldehyde, and anisaldehyde. The two latter can be bought for 8s.–10s. per lb., but benzaldehyde costs under 2s. per lb.; taking the same quantities as were used in the experiments, 1 lb. is enough for about 200 traps, which retain their efficiency for at least a week. To prevent possible oxidation of the aldehyde, a trace of formaldehyde may be added. In the experiment traps two species of Thrips were caught, but neither was identified. The method adopted was to expose small bowls, each containing about half a pint of water with 2 c.c. of the aldehyde stirred up in it. The insects attracted are drowned in the water. The experiments were made in November and December, a season when Thrips is far from abundant, and consequently the figures showing the numbers caught are small. The author believes that in warmer weather the catches would be larger. He proposes to continue the experiments in warm weather and to use nitrobenzene, a substance which does not contain the aldehyde group, but which has a smell closely resembling that of benzaldehyde. It should then be possible not only to obtain more evidence as to the practical economic value of the method, but to ascertain also whether the attractiveness is due to the presence of the aldehyde group, or whether the insect's olfactory sense is, like our own, similarly affected by nitrobenzene and benzaldehyde.

Hood (J. D.). **On the proper Generic Names for certain Thysanoptera of Economic Importance.**—*Proc. Entom. Soc., Washington,* xvi, no. 1, March 1914, pp. 34-44.

The author contends that the tobacco thrips, the pear thrips and the orange thrips—species responsible in the United States for damage amounting to many thousands of dollars every year, are at present wrongly placed in the genus *Euthrips*, Targ., and should be known as *Frankliniella fusca*, Hinds, *Taeniothrips pyri*, Dan., and *Scirtothrips*

*citri*, Moulton, respectively. The purpose of the present paper is to correct the generic positions of these and allied species. The account is divided into three parts: first, a brief general discussion of the nomenclature of the several groups of species which have been included in the genus *Euthrips*; second, a catalogue of the American components of the genera to which these species belong; and third, a bibliography of all papers necessary to a proper study of these questions.

Walton (W. R.) **A New Tachinid Parasite of** ***Diabrotica vittata***.—*Proc. Entom. Soc., Washington*, xvi, no. 1, March 1914, pp. 11-14, 1 pl.

In 1871 Shimer described a Tachinid parasite of *Diabrotica vittata*, the cucumber beetle, under the name of *Celatoria* (*Melanosphora*) *diabroticae*. The author gives in the present paper an account of a second Tachinid parasite of this beetle, which he described as *Neocelatoria ferox* (gen. et sp. nov.).

Coad (B. R.) & Pierce (W. D.). **Studies of the Arizona Thurberia Weevil on Cotton in Texas.**—*Proc. Entom. Soc., Washington*, xvi, no. 1, March 1914, pp. 23-27.

In order to establish the taxonomic status of the weevil breeding in Arizona wild cotton (*Thurberia thespesioides*) the authors undertook a number of studies, the results of which are given in the present paper. This weevil very closely resembles the Mexican cotton boll weevil (*Anthonomus grandis*), and an account of it has already been given, under the name of *A. grandis* var. *thurberiae* [see this *Review*, Ser. A, ii, pp. 78–79]. Experiments were made, the principal results of which were to show that the two varieties are able to interbreed and produce fertile offspring. The question whether the *thurberiae* form will flourish on cultivated cotton is now being tested.

Pierce (W. D.) & Morrill (A. W.). **Notes on the Entomology of the Arizona Wild Cotton.**—*Proc. Entom. Soc., Washington*, xvi, no. 1, Mar. 1914, pp. 14-23.

The Arizona Wild Cotton plant assumed economic importance on being found in 1913 to harbour a variety of the dreaded Mexican cotton boll weevil (*Anthonomus grandis*, var. *thurberiae* Pierce). The authors have since made a thorough examination of the insects associated with this plant.

The plant is a perennial, resembling the cotton plant so closely that it is locally known as wild cotton; it occurs at altitudes of 2,300–5,000 feet in Arizona. The species of insects recorded from the plant are 83 in number distributed as follows: Acarina 1, Rhynchota 14, Orthoptera 3, Thysanoptera 2, Lepidoptera 7, Coleoptera 24, Hymenoptera 29, Diptera 2, and Strepsiptera 1; according to their behaviour towards the plant these insects may be classified as injurious 25, nectar-visiting 40, parasitic 12, and predaceous 6. The most important injurious insects are the boll-weevil (*Anthonomus grandis thurberiae*), the cotton worm (*Alabama argillacea*), the Thurberia boll worm (*Sacadodes pyralis*, Dyar), a blister mite (*Eriophyes* sp.), a gall-forming insect belonging to the family Cecidomyiidae, and a mealy bug (*Pseudococcus* sp.).

# NOTICES.

**The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.**

**Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.**

**The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.**

**All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.**

# CONTENTS.

VOL. II. Ser. A. Part 5.—pp. 273-336. MAY, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

S

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.

THE EARL OF CROMER, G.C.B., O.M., G.C.M.G., *Chairman.*

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. AUSTEN, Entomological Department, British Museum (Natural History).
Dr. A. G. BAGSHAWE, Director, Tropical Diseases Bureau.
Sir J. ROSE BRADFORD, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., A.M.S.
Dr. S. F. HARMER, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.
The Hon. Sir JOHN MCCALL, M.D., Agent-General for Tasmania.
Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.
Sir JOHN MCFADYEAN, Principal, Royal Veterinary College, Camden Town.
Sir PATRICK MANSON, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir DAVID PRAIN, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. READ, C.M.G., Colonial Office.
The Honourable N. C. ROTHSCHILD.
Mr. HUGH SCOTT, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. SHIPLEY, F.R.S., Master of Christ's College, Cambridge.
Sir STEWART STOCKMAN, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. THEOBALD, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. J. A. C. TILLEY, Foreign Office.
Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.
Mr. A. C. C. PARKINSON (Colonial Office).

Director and Editor.
Mr. GUY A. K. MARSHALL.

Assistant Editor.
Mr. W. NORTH.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

**An Act to prevent the Introduction into British India of any Insect, Fungus or other Pest, which is or may be destructive to Crops.**

An Act entitled "The Destructive Insects and Pests Act, 1914," which received the assent of the Governor-General of India on the 3rd February 1914, empowers the Governor-General in Council to prohibit or regulate, by notification in the Gazette of India, the import into British India of any article or class of articles likely to cause infection to any crop. Customs Officers are authorized to deal with any such prohibited articles as though they had been restricted or prohibited under the Sea Customs' Act. The Local Government is empowered, subject to the control of the Governor-General in Council, to make rules for the detention, inspection, disinfection or destruction of any such articles or of any article that may have been in contact or proximity thereto. Fines up 1000 rupees may be inflicted for a breach of such rules.

**A New Regulation prohibiting the Importation of Potatoes into Canada.**

The following Order-in-Council was passed on the 7th March 1914, amending the regulations under The Destructive Insect and Pest Act of the Dominion of Canada, in order to prohibit the importation of potatoes from California :—

"The Regulations under 'The Destructive Insect and Pest Act,' established by Order-in-Council, dated 11th May, 1910, are amended by adding to Section 12 thereof, which contains a list of destructive insects, pests and diseases to which the said Act shall apply, the following insect pest—'the Potato Tuber Moth (*Phthorimaea operculella*, Zell.)'; and by adding to Section 13, after the word 'Miquelon' in the second line thereof, the following words, 'also the State of California, being one of the United States of America.'"

**A Notice restricting the Importation of Coffee Plants or Coffee into the Uganda Protectorate.**—*Uganda Official Gazette*, 28th Feb. 1914.

This notice prohibits the importation of coffee plants (whether living or dead) and coffee, other than roasted beans and ground coffee, into the Protectorate except under a written permit previously obtained from the Director of Agriculture. This prohibition does not apply to properly packed and sealed packages of plants or coffee passed in transit through the Protectorate. But if such a package is opened in transit or is so damaged that its contents may escape, the package and its contents may be destroyed without compensation.

Vuillet (A.). **Sur la présence de *l'Aphis maidis*, Fitch, en Afrique occidentale.** [Presence of *Aphis maidis* in West Africa.]—*Bull. Soc. Entom. de France, Paris*, 1914, no. 3, pp. 116-117.

*Aphis maidis*, the widely distributed pest of maize and Indian millet has been found for the first time in Africa during the past few years. In the French Sudan it has been found both on maize and millet, rolled up in the leaf or on the inflorescence. Although it must be regarded as a pest, it is not the cause of as much damage as is due sometimes to the allied species, *A. sorghi*, Theo.

Shtchegolev (Ir.). **Непарный шелкопрядъ въ Крыму.** [Lymantria dispar L. in the Crimea.]— **« Садоводъ »** . [*Horticulturist*], *Rostov-on-Don,* Jan. 1914, pp. 18-30.

This is a short report on the outbreak of *Lymantria dispar* which took place in 1913 in the Crimea. Normally these insects are not of any great importance, but in 1913 the area infested by them amounted to at least 54,000 acres, mostly forests, with intervening orchards. It was already clear in the autumn of 1912 that an outbreak of the pest was to be expected, as an examination of the forests had shown that there was scarcely a tree which did not bear one or two egg-masses. Sometimes three or four layers of eggs were deposited one above the other, and dead moths were frequently found covered with eggs of other moths ; the masses averaged 500 eggs each, this number rising sometimes to 800.

The Entomological Station of Simferopol distributed posters and organized a series of popular lectures on the fighting of these insects ; while the Administration of the State Domains (having control over the forests) convened a conference of foresters of the Crimea to decide on a plan of campaign. Attention has been chiefly directed to the protection of the orchards which were the most threatened by the outbreak. As to the forests, it was resolved to limit the campaign only to the protection of the more valuable plantations and nurseries, for the inaccessibility of the mountain forests of the Crimea renders it impossible to take any effective measures for protecting them that would be worth the outlay. A wholesale destruction of the eggs was carried on in the orchards and neighbouring forests by soaking the egg-masses with carbolineum, or with a mixture of kerosene and birch tar, or with crude oil. This method proved most successful, and was preferable to the scraping down of the masses by means of various tools, for in the latter case a considerable number of eggs escaped destruction. In some localities, where the forest boundaries closely approached the orchards, a strip of forest was cut down and burnt. On the cleared space trenches were dug to stop the advance of the caterpillars, or else boards smeared over with tar or some other sticky material were used. In some places the caterpillars were transported by wind over considerable distances—as much as from four to seven miles—and the fight against them had to be conducted incessantly, as constantly fresh swarms were brought by the same means. Insecticides were largely used, chiefly Bordeaux mixture with Paris green, the spraying having frequently to be repeated owing to the rains ; the formula recommended was 2·4 drams of green for 2·7 gallons of water. Djipsin also proved very useful, while no effect was obtained by such insecticides as tobacco extract, which is harmless in the case of caterpillars covered with hairs. Sticky bands were applied with success ; and the caterpillars were also shaken down from the trees and then destroyed by crushing. American tanglefoot being expensive and not being available in sufficient quantity, cart-grease with ordinary birch tar was used as a substitute and also a mixture of castor oil with resin ($\frac{1}{2}$–$\frac{3}{4}$ lb. of resin added to 1 lb. of heated castor oil and boiled to the proper consistency). Notwithstanding the many defects of the latter preparation, it being often either too liquid or too hard, it proved very useful, although it required much attention from the owners to keep it in working order.

At a later period in the life of the caterpillars the fight against them was assisted by the activity of parasitic Tachinid flies, as well as by an outbreak of flacherie; the pupae also were infected by some disease. All this led to a diminution of the next generation, which appears at the end of summer, and only a few dwarfed specimens of *L. dispar* were found at that time.

According to the author's observations, the eggs are mostly laid at a height of 1–1½ ft. from the ground and only in a few cases were they deposited higher, at from 7 to 9 feet; sometimes they were found underneath the surface of the soil, in spaces between the trunk and the earth. His observations do not confirm the common view that the females prefer the southern side of the trees; he sometimes found trees the northern side of which had more eggs than the southern one, and he is inclined to think that the females are influenced rather by the wind and rain, which drive them to seek protection on the opposite side of the tree, without regard to the question of light or warmth. As to the kinds of trees not injured by the caterpillars, it appeared that they did not touch pear trees in orchards, even when they were situated close to apple trees, which were quite defoliated. In forests they did not attack dwarf medlars, although eggs were sometimes found on these trees; ash trees suffered little, while the greatest damage was caused to oaks; all other trees were also more or less injured. All the searching for parasites of the eggs of *L. dispar* proved of no avail and none were reared from the immense number of eggs kept for the purpose, except for a single egg-mass which contained some 20 specimens of *Hadrotus howardi*, Mokrz. In conclusion the author states that in Russia *L. dispar* appears in great numbers only during a short period of successive years—rarely more than three—after which its numbers diminish to quite negligible quantities, chiefly owing to various parasites and diseases, and the unfavourable climatic conditions.

Gowdey (C. C.). **The Yellow-headed Coffee Borer** (*Dirphya* (*Nitocris*) *princeps*, **Jord.**)—*Bull. Entom. Research, London*, iv. pt. 4. Feb. 1914. pp. 279-281.

This Longicorn beetle is a pest of *Coffea robusta* and *C. arabica* in Uganda; it was recorded as such on *C. robusta* for the first time in 1910. Some of the estates have suffered serious damage, especially the older ones which are badly affected by the coffee leaf-disease, *Hemeleia vastatrix*; with a single exception, outbreaks of the pest have been traced to plots where the leaf-disease was already prevalent and where the trees were consequently least vigorous.

Regarding its life-history the author has made the following observations. The female beetle loosens a bit of bark on a branch, from 4–6 inches from the tip, and lays its eggs singly under the bark. The young larva bores into the main stem and downwards into the cambium; the tunnels continue to the surface of the ground and often extend into the main root, being sometimes as much as 4 feet in length; at distances varying from 2–5 inches horizontal tunnels are bored leading to the exterior, for the purpose of getting rid of the frass. Pupation takes place in the stem. The beetle has not been observed to feed either on the leaves or on the bark. The life-cycle appears

to be a long one, extending over two or three years, and larvae of various sizes are to be found throughout the year; the pupal stage lasts from seven to nine weeks, usually from November to December.

The trees attacked may be located by means of the frass at the base. If the presence of the grub is detected in the branch before it has reached the stem, the branch may be cut off and burned. If the grub has already reached the stem, the method of treatment adopted by the author is to seal up the horizontal exits and to drop a few drops of carbon bisulphide or carbon tetrachloride into the tunnel, which may be exposed by cutting off the branch through which the insect entered the stem as close to the stem as possible. When the operation is finished the dust, etc., at the base of the tree should be brushed away, for if none is found on the next visit it may be concluded that the insect is dead. Neither of the above liquids has a harmful effect on the trees. Using paraffin oil instead of these liquids or spearing the insect with a wire, as is done in German East Africa for *D. usambica*, are less satisfactory methods. Trees infested by *D. princeps*, if untreated, are either killed outright, or broken off by the wind on account of the extensive tunnelling. Trees younger than two years do not appear to be attacked.

NEWSTEAD (R.). **Notes on Scale-Insects (Coccidae), Part II.**—*Bull. Entom. Research, London*, iv. pt. 4. Feb. 1914. pp. 301-311. 7 figs.

Thirty-seven species of Coccids are dealt with from the following countries: The Dutch West Indies, Barbados, British Guiana, Zanzibar, Uganda, Nyasaland, and Nigeria. Five species are described as new, namely *Icerya maxima*, on *Ficus* sp., from the Gold Coast; *Aspidoproctus giganteus*, on the Silk Cotton tree (*Ceiba bombax*), from S. Nigeria; *Aspidiotus* (*Pseudaonidia*) *baikeae*, on *Baikea insignis*, from Uganda; *A.* (*P.*) *fossor*, on grape-vine, from Barbados; *Chionaspis funtumiae* on *Funtumia latifolia*, from Uganda.

THEOBALD (F. V.). **African Aphididae.**—*Bull. Entom. Research. London*, iv. pt. 4. Feb. 1914. pp. 313-337. 17 figs.

A complete list is given of the species of APHIDIDAE recorded from Africa. Several of the species mentioned are common also in Europe, such as the Common Cabbage Aphis (*A. brassicae*) and the Ribes and Lettuce Aphis (*Rhopalosiphum lactucae*); others have a world-wide distribution, having doubtless been disseminated on nursery stock; such are the Black Peach Aphis (*Aphis persicae*) and the Woolly Aphis (*Eriosoma lanigerum*). As regards the group as a whole, it has been very little studied in Africa, and the entire list includes only 35 species. Of these nine are new, namely: *Macrosiphum lophospermum*, from Njoro, British East Africa; *M. lycopersicella* on tomato and rape, from Njoro; *M. neavei*, from Nyasaland; *Macrosiphoniella bedfordi*, on cultivated chrysanthemums, from the Transvaal; *Aphis solanella*, from Njoro; *A. ligustriella*, on privet, from Pretoria; *A. nigripes*, on willow, from Pretoria; *A. africana*, on broom-corn and barley, from Njoro; and *Lachniella thujafolia*, on *Thuja orientalis*, from the Transvaal.

**Ballard (E.). A list of the more important insect pests of crops in the Nyasaland Protectorate.**—*Bull. Entom. Research, London,* iv. pt. 4. Feb. 1914. pp. 347-351.

A list is given of those insects of economic importance which have been collected or bred from various crops in Nyasaland during the first three months of the planting season 1911–12 and the whole of the season 1912–13. Insect pests of first-class importance are ten in number and are confined to cotton, tobacco and maize; the others included in the list have done sufficient damage to justify regarding them as pests, or are such that an increase in their numbers would be a danger to crops on which they have taken to feeding. *Orthoptera*: Acridiidae: The most destructive are *Maura bolivari*, Kirby, and *Chrotogonus* sp., both pests of tobacco; less harmful are *Acrida turrita*, L. on tobacco and *Zonocerus elegans*, Thumb. Gryllidae: *Brachytrypes membranaceus*, F., sometimes eats the roots of cotton plants.

Lepidoptera:—Noctuidae: *Diparopsis castanea*, Hmp. (the Red Boll-worm), a major cotton pest of great importance; *Chloridea obsoleta*, F., destroys the bolls and flowers of cotton and attacks maize, tobacco seed-pods, and chick-peas; *Earias insulana*, Boisd., a cotton pest, but partly kept in check by an ichneumon parasite; it is also found on garden Hibiscus; *Euxoa segetum*, Schiff., is responsible for much loss in tobacco fields by cutting the stems; *Prodenia litura*, F., occurs on tobacco, cotton and maize, and was once found on tea; other species damaging cotton by eating the leaves in the first stages of growth are *Plusia orichalcea*, F., *Cosmophila erosa*, Hb., *Gonitis sabulifera*, Guen., *Plusia chalcites* and *Acontia graellsii*, Feisth. *Busseola fusca*, Hmp., is one of the worst pests in the Protectorate, causing a great annual loss in the native gardens by boring in the stems of maize and millet. *Pteronycta fasciata*, Hmp. (gen. et sp. nov.) bores in the stems of cotton, which are consequently very liable to be broken by the wind; it is at present uncommon. Limacodidae: *Parasa vivida*, Walk., is an occasional but destructive pest of coffee. Lymantriidae: *Heteronygmia leucogyna*, Hmp., a serious pest of mahogany. Pyralidae: *Sylepta derogata*, F. is rare in the Zomba district, but is a serious pest of cotton further north; the larvae are parasitised by a Chalcid. Tineidae: *Phthorimaea heliopa*, Lower, a stem-borer of young tobacco and a serious pest; *Gracilaria* sp. nov. ?, a common, but at present not serious, pest of cotton. Nymphalidae: *Hypolimnas misippus*, L. on cotton.

Coleoptera:—Lagriidae: *Lagria villosa*, F., moderately destructive in vegetable gardens to leguminous plants. Galerucidae: *Ootheca mutabilis*, Sahlb., on cotton, leguminous and cucurbitaceous plants; *Diacantha conifera*, Fairm., also on leguminous and cucurbitaceous plants; *Asbecesta cyanipennis*, Har., on leguminous plants; *Pachytoma gigantea*, Fll., on Mlanje cypress. Tenebrionidae: *Zophosis* sp., a minor pest of cotton and tobacco; *Gonocephalum simplex*, F., on tobacco. Meloidae: *Mylabris tricolor*, Gerst,. *M. amplectens*, Gerst., *M. dicincita*, Bert., *Decatoma catenata*, Gerst., are all destructive flower-eaters, occurring on cotton; *Ceroctis trifurca*, Gerst., eats the flowers of soya and velvet beans. Curculionidae: *Apion armipes*, Wagn., on cotton; a species of *Isaniris* is a general but not very destruc-

tive pest on cotton. COCCINELLIDAE: *Epilachna dregei*, Muls., *E. hirta*, Thumb., and *E. paykulli*, Muls., are major pests in vegetable gardens; *Chilomenes lunata*, F., preys on the cotton aphis, and is a very useful insect. CASSIDIDAE: *Cassida gibbipennis*, a minor pest on leguminous plants. NITIDULIDAE: *Epuraea* sp., eating stamens of cotton flowers.

Hymenoptera:—TENTHREDINIDAE: *Athalia* sp., a major pest on turnips and cabbages.

Rhynchota:—APHIDIDAE: *Aphis gossypii*, Glover, very troublesome on cotton; *Aphis brassicae*, L., on cabbages; COCCIDAE: *Pulvinaria jacksoni*, Newst., occurs occasionally on cotton. COREIDAE: *Anoplocnemis curvipes*, F., on cotton and on mahogany. PENTATOMIDAE: *Antestia variegata*, Thumb., a serious pest of coffee; *Atelocera stictica*, Westw., on young shoots of mahogany. PYRRHOCORIDAE: *Dysdercus nigrofasciatus*, Stål, a major pest of cotton; *Odontopus confusus*, Dist., on cotton.

**Order in Council under Sections 2 and 3 of "The Destructive Pests Ordinance 1912" with respect to Cocoa and Rubber Plants and Seeds.**—*Gold Coast Government Gazette, Accra.* no. 68, 23rd Aug. 1913, p. 945. [Received 15th April 1914.]

This Order in Council contains the following provisions:—

It shall not be lawful for any person to import any cocoa or rubber plants or seeds into the Gold Coast Colony except through the Ports of Accra and Sekondi. No cocoa or rubber plants or seeds shall be so imported which have not been disinfected before shipment in a manner approved by the Director of Agriculture. All cocoa and rubber plants and seeds so imported shall be accompanied by a certificate, to the satisfaction of the Director of Agriculture, certifying that such disinfection has been duly and properly carried out. All cocoa and rubber plants and seeds arriving without a certificate, or with a certificate which is not to the satisfaction of the Director of Agriculture, shall be destroyed, or landed at such place as the Director of Agriculture may direct and there disinfected under his supervision at the expense of the importer.

VUILLET (A.). **Le Thrips du Poireau.** [The Thrips of the Leek.]—*Rev. Phytopath. App., Paris*, i, no. 10, 20th Oct. 1913, pp. 136-137. [Recd. 30th March 1914.]

*Thrips tabaci*, Lind., is common in both the Old and New Worlds. In the United States it is known as the onion thrips, and it seems to have been introduced there from Europe. It occurs throughout the whole year on a great number of plants belonging to very different families such as the Cruciferae, Leguminosae, Caryophyllaceae Compositae, Solanaceae, Labiatae, Liliaceae, etc. The families. Liliaceae and Solanaceae are the ones which perhaps suffer the most. With regard to the leek, for several years Blais observed that this plant became discoloured towards the middle of summer, whilst small larvae swarmed in the folds of the leaves. In 1913, the first damage was observed at the end of June, and the perfect insect appeared at the beginning of September. The attacked leaves first became

discoloured and then the ends dried off. The plants would not grow and the attack of the Thrips reduced the harvest by 50 per cent. The insects persist through winter generally on stray plants or under dead leaves. The time taken for the complete transformation varies greatly according to conditions, the insects observed by Lindeman in Bessarabia taking 47 days, while those bred by Quaintance in Florida took only 17 days. Most authorities consider that the multiplication of *Thrips tabaci* is favoured by drought and seriously hindered by rain. The author however is of the opinion that moisture is not really unfavourable to this insect, but rather that drought weakens the plants and diminishes their resisting power. Fields are often invaded by Thrips which have hibernated and developed on wild plants. The destruction of such vegetation on the borders of fields would therefore be a preventive measure, especially if it be burnt during the winter. In order to counteract the effect of drought and allow the plants to resist effectively the attacks of the insect, irrigation should be employed where possible. Most contact insecticides are effective against this Thrips, but unfortunately the insects are difficult to reach since they occur in the folds of the leaves. A simple 3 per cent. soap solution is effective in most cases.

HOLLOWAY (T. E.). **The Prospect of controlling the Sugar-Cane Borer more efficiently.**—*Louisiana Planter and Sugar Manufacturer, New Orleans, La.*, li, no. 25. 20th Dec. 1913, p. 416, 3 figs. [Recd. 30th March 1914.]

Experiments on the control of the sugar-cane moth (*Diatraea saccharalis*) have been extraordinarily successful. On the Piper plantation, Texas, no cane trash was burned in the autumn and winter of 1912–13, but it was all ploughed under in the spring of 1913. On the neighbouring plantations the trash was burned in the autumn as usual. On examination it was found that the average infestation of the unburned fields was 30·6 per cent., while that of the burned fields was 76 per cent. In 1912, the average infestation of the burned fields was 50·5 per cent. and a few miles away 86 per cent. Burning over a field is the obvious method of controlling an insect pest in certain cases, but the sugar-cane field presents a different problem. The borers stay in the stalks and when the stalks are passed through the mill the borers are killed. On the field are left a few borers in the tops, and probably more in the stubble, and egg-parasites on the leaves and in the egg-masses of the borers which are attached to the leaves. If the leaves are burned, many parasites are killed and only a few borers. When the cane begins to grow next season, the borers come up from the stubble, and very few parasites are then present to control them. These parasites are very valuable in destroying the eggs of many other moths besides those of the sugar-cane moth and should in no way be destroyed. From these experiments the author is of opinion that the disposal of the trash by ploughing under will give the most satisfactory results, though he notes that the plan of raking the trash to the headlands, as done by Mr. Taggart at Audubon Park, resulted in a greater reduction in the percentage of infestation than was accomplished by ploughing the trash under in the spring in Texas.

Morgan (A. C.) & Crumb (S. E.). **The Tobacco Splitworm.**—*Bull. U.S. Dept. Agric., Washington, D.C.*, no. 59, 19th Jan. 1914, 7 pp. [Recd. 14th April 1914.]

The tobacco splitworm (*Phthorimaea operculella*, Z.) has been reported as having done serious damage to the potato in California. The variation in food habits had created the suspicion that the form working upon potatoes might be specifically distinct from the one attacking tobacco. During the summer of 1913 experiments were conducted to determine this point. The earlier stages of the two types differ only in size and coloration. By transposing the food-plants the larvae can be made to approach each other in colour, and this character is therefore scarcely sufficient to justify a specific separation. The difference in size disappears when the potato-tuber moth is reared on other plants. In the United States the species occurs in California and southward from a line connecting the District of Columbia and Colorado, including Tenessee, Virginia, North Carolina, South Carolina, Florida and Texas. The known range also includes Cuba, Costa Rica, Peru, Hawaii, Australia, Tasmania, New Zealand, Sumatra, Transvaal, Rhodesia, Algeria, and Southern Europe. The known food-plants of *Phthorimaea operculella* include *Solanum torvum*, *S. verbascifolium*, *S. carolinense*, *S. nigrum* (?), egg-plant (*S. Melongena*) potato, tomato, *Physalis peruviana*, *Physalis* sp., *Physalodes physalodes*, *Datura stramonium*, and tobacco. The larva occurs as a borer and also as a leaf miner, the former probably being the original habit. In Cuba and the United States the insect is known on tobacco as a leaf-miner only. A boring tendency is still apparent, however, as noted by Houser, in that the larva usually tunnels the midrib or a vein in addition to mining the membrane of the leaf. Only the older tobacco leaves are affected, unless the infestation is very severe, and they become blotched, the tobacco being rendered unfit for wrappers. In mining the leaf the larva spins a tent of silk and under this consumes the parenchyma. Eggs are deposited singly on the foliage of the host plant and, after about four days, the larvae emerge. The larva is very active and continues its work for about 15 to 17 days, after which it pupates in a tough cocoon of silk and débris in the clods or rubbish at or near the surface of the soil, the pupal stage lasting from six to nine days. Descriptions are given of the various stages and tables showing the times occupied by them. Two larval parasites are recorded, namely, the Braconid, *Chelonus blackburni*, Cam., and the Ichneumonid, *Limnerium polynesiale*, Cam. As remedial measures Quaintance recommends pinching the larvae in the leaves and the destruction of all trash in and around tobacco fields and barns. In severe infestations it may be necessary to prime off and destroy the leaves infested by the earlier generations. It is also well to transplant the crop as early as possible, in order to mature it before the appearance of the most destructive generation of the splitworm. All tobacco stubble should be destroyed as soon as the crop is harvested, to prevent the breeding of a hibernating generation. Potatoes should not be followed by tobacco, for the infestation of tobacco has been more severe in such cases, than where a different rotation was followed. Potatoes and tobacco should be grown as far apart as possible.

**Mitteilungen der Station für Pflanzenschutz in Hamburg.** [Communications from the Hamburg station for plant protection.]—*Zeits. für Pflanzenkrankheiten, Stuttgart,* xxiv, no. 1, 31st Jan. 1914, p. 41.

The San José scale was found on 2·29 per cent. of fresh fruit imported from North America, and on 0·25 per cent. of that from Australia. The living plants on which it was found were two *Prunus* in pots from Japan. The drought caused an increase of the Aphids on many field and garden fruit-trees, many varieties of beans suffering from the attacks of the black aphis. Bird protection was advanced by the provision of suitable copses, nesting places, feeding places and the circulation of advice on the subject.

Johnson (F.). **The Grape Leafhopper in the Lake Erie Valley.**—*Bull. U. S. Dept. Agric., Washington, D.C.,* no. 19, 24th Jan. 1914, 47 pp., 13 figs., 3 pls.

The grape leaf-hopper, *Typhlocyba comes*, Say, and its several varieties are of common occurrence on native grape-vines throughout the United States and Canada, having been first recorded from Missouri in 1825. During the growing season of the grape-vine, this leaf-hopper apparently confines its attacks to the foliage of this plant. Early in the spring the adults feed on the new foliage of almost any plants with which they come in contact, whether it be the foliage of trees and shrubs in woodlands, or the weeds and grasses in the more open arable and pasture lands; but when the leaves of the cultivated vines unfold there is a complete migration of the hoppers from the wild plants, including the wild grape-vines, to the cultivated vines. By repeated observations it has been found that this insect reproduces only on the foliage of wild and cultivated grapes, and more freely upon the latter. The insect in its nymphal and adult stages sucks the juices from the leaves, causing, in severe cases, the whole vine to become dried up and almost functionless long before the normal ripening of the fruit. Prof. H. J. Quayle states that with the exception of *Phylloxera*, the vine-hopper is undoubtedly the most destructive insect pest of the vine in Ohio State. The insect is generally present everywhere and may occur for several seasons without attracting attention; then it begins to increase and finally becomes so abundant as to cause severe damage. The species most commonly associated with *T. comes* is *T. tricincta*, the proportion of the species varying in different areas. *T. vulnerata* was also present on the North, South and Middle Bass Islands, and on Kelly's Island. The adults usually commence to attack the vines about the middle of May, and in 1912 the first eggs were found on 10th June, and the appearance of a new brood occurred on 12th July. From experiments it would seem that some females may deposit about 140 eggs. In normal seasons the majority of the first brood adults appear after the middle of July and the nymphal period is lengthened by low temperatures. If high temperatures prevail, the nymphs develop rapidly and these will mate and deposit eggs resulting in a second brood of nymphs. Towards the middle and end of September, the adults of both broods migrate from the vineyards and come to rest in adjoining woodlands or rough pasture lands, later seeking the shelter of leaves and trash. During investigations on this pest only one instance of parasitism was noted, when P. R. Jones

observed a female *Aphelopus* sp. (PROCTOTRUPIDAE) thrusting her ovipositor into the body of a nymph. On the other hand the nymphs seem to be specially subject to the attack of predaceous enemies which include *Hemerodromia superstitiosa*, Say, and *Hyaloides vitripennis*, Say, *Rhyncholophus parvulus*, Banks, the larvae of *Chrysopa*, ants, and coccinellidae, and spiders. In one case the leaf-hoppers were found to be attacked by *Empusa*, sp. Numerous control methods are mentioned and references to them given in a lengthy bibliography. In the vineyards in Chautauqua County, N.Y., Slingerland carried on extensive experiments with sticky shields for catching the adults before the commencement of oviposition, the most practical shield for trellised vineyards being constructed and used as follows : Make a light wooden frame about seven or eight feet long and four feet wide, having the bottom cross-piece about a foot from the ground and fasten to this stiff wires extending down nearly to the ground and bent inward something like hay-rake teeth. Tack over this a strip of table oilcloth $1\frac{1}{4}$ yards wide and let it extend down over the curved wire teeth so that when the shield is held beside a vine, the oilcloth will come under the vine to catch the "hoppers" that try to drop to the ground. Cover the oilcloth with the "stick-em" and all is ready to operate. Two men, each carrying one of these light sticky shields on opposite sides of a trellis of vines, can reach over the shields, jar the vines to disturb the "hoppers" and thus go over an acre of vineyard in a little more than an hour.

In California, where the vines are not trained to a trellis, Mr. Quayle found that a screen cage, having the inside smeared with crude oil, with one side open and a V-shaped opening cut in the bottom to admit the stem of the vine, could be used quite effectively in the vineyards to catch the adults before oviposition commenced. Owing to the migratory habit of this insect the destruction of leaves and trash in vineyards cannot have very great results. Sprays used against the adults are of little value owing to the agility of the winged insects and the protection afforded to their bodies by the wings. Against the nymphal stages the following solutions have been used with great success :—1 lb. whale-oil soap to 15 gallons of water ; or 1 lb. resin to 15 gallons of water, adding enough soda or potash to dissolve the resin completely, i.e., 1 lb. of soda to about 8 lb. of resin. This soapy liquid has a tendency to form a drop on each berry which causes an undesirable discoloration on the grapes. In the last few years therefore tobacco extracts have been used instead. These, used according to the following formulae, have given excellent results; (*a*) tobacco extracts containing 2·7 per cent. nicotin sulphate, diluted in the ratio of 1 part to 150 parts of water ; (*b*) tobacco extracts containing 40 per cent. nicotin sulphate, diluted in the ratio of 1 part to 1,500 parts of water. The most effective time to make the tobacco spray application against the nymphs is just before those that hatched earliest in the season have reached the fourth moult, i.e., when the wing pads extend about one-third the length of the abdomen. When it is deemed expedient to use sticky shields to capture the adults, the best sticky substance to use is a mixture of melted resin, 1 quart, in 1 pint of castor oil, smeared liberally over the face of the shield. Successful control of the nymphs by spraying depends on thoroughly wetting all parts of the underside of the infested leaves with the spray liquid.

MORSTATT (H.). **Arbeiten über Schädlinge der Kulturpflanzen.** [Studies of pests of cultivated plants.]—*Der Pflanzer, Dar-es-Salaam*, x, no. 1, Jan. 1914, pp. 36-39.

This is a chapter of Dr. Morstatt's Zoological Report embodied in the Annual Report of the Biologisch-Landwirtschaftliches Institut at Amani, 1912–1913. No extensive outbreaks occurred in the twelve months under review. Some damage was done by *Pseudococcus citri* to mango and other trees, chiefly on the coast, and by a weevil, *Apion xantho-stylum*, to cotton in Morogoro; a disease of cotton was caused by Aphids in Mwanza, and a great increase of *Coccus viridis* on coffee was observed in Meru. With the exception of that of *Apion*, all these epidemics were probably connected with the dry weather.

*Cotton pests.* The weevil already mentioned requires serious attention as it has been shown that its larvae also develop under the bark of the woody portions and this often seriously checks growth. The *Mafuta* disease due to Aphids is not important. Reported from Amani last year, the boll-worm *Pyroderces simplex* (*gossypiella*), Wlsm., has now appeared in Mombo. It is of no importance compared with the pink boll-worm. Another species of stainer, *Dysdercus festivus*, Gerst., now brings the number known up to five. In general it does little damage.

*Coffee pests.* The white coffee borer *Anthores leuconotus* was reported from plantations hitherto immune in Usambara, Kilimandjaro and Meru. A regular control is necessary, as this pest constitutes a constant danger to the plantations, although with careful planting supervision serious damage need not be feared. The effect of weather conditions combined with thorough preventive measures have brought the green scale under control.

*Pests of Vegetables.* A sawfly, *Athalia* sp., has much increased and its larvae did great damage to mustard and other cruciferous plants. The diamond backed moth, *Plutella maculipennis*, Curt., was as numerous as in the previous year.

*Cacao pests.* *Ceratitis anonae*, Graham, attacked cacao, but so far the ripening of the pods has not been affected. A leaf-eating weevil, *Polyrhabdotus transversalis*, Fst., also occurred on cacao.

*Rubber pests.* A termite near *Termes natalensis*, Hav., and new to East Africa, is an important new pest. It destroyed numerous *Manihot glaziovii* trees in various plantations. It either gnaws the wood under the tapped bark, or destroys the roots. A detailed report will follow.

*Bean pests.* The Wonder beans (Kundebohne) planted at Amani were badly attacked during the year. The small weevil, *Apion varium* var. *vicinum*, Wagn., was the pest most frequently met with. In beans planted for the purpose of breeding the pests, the beetle *Bruchus chinensis*, L., developed in large numbers. Other beetles found there were the Anthribid, *Araeocerus fasciculatus*, de G., and a very small Scolytid. Three moths also occurred, *Sitotroga cereatella*, Ol., being the commonest.

*Coconut pests.* The palm beetle, *Rhynchophorus phoenicis*, occurs in the Dar-Es-Salaam district, but is not an important pest as yet.

**Extrait du Procès-Verbal de la Séance de la Section de l'Entomologie.** [Extract from the Proceedings of the Meeting of the Entomological Section.]—*Bull. Soc. Nat. Acclimat., Paris.* lxi, no. 3, 1st Feb. 1914, pp. 84-85.

M. Rivière reported on the damage caused by the bug, *Aelia germari*, to cereals. This insect appears to be spreading in North Africa, especially in the province of Oran, Algeria. The insect attacks the ear of the cereals and sucks the sap from the seed, preventing germination. Several plants, chiefly graminaceae and especially the genus *Stipa*, seem to be visited by these insects, and at night *Aelia* takes refuge in other plants, returning to the cereals during the daytime. No method of control is known. *Aelia germari* closely resembles *A. acuminata*, L., which is common throughout Europe.

**Termites or white ants.**—*Agric. News, Barbados.* xiii. no. 309, 28th Feb, 1914, p. 74.

The occurrence of termites in St. Kitts, as a pest of growing sugar-cane, has been referred to from time to time. Collections of these and other termites, from the same and other islands, have been made and sent to the Imperial Bureau of Entomology for study. The material submitted was found to include eleven species, of five genera. *Calotermes balloui* occurred in Grenada and St. Vincent, *C. castaneus* in Barbados, *C. incisus* in Barbados and St. Kitts, and *C. venezolanus* in St. Kitts. *Eutermes acagutlae* occurred in Porto Rico, *E. costaricensis* in St. Kitts,* *E. haitiensis* in Montserrat, Antigua and St. Kitts, *E. sanctae-luciae* in St. Vincent. *Leucotermes tenuis* occurred in Barbados, *Mirotermes marshalli* in St. Kitts and *Rhinotermes marginalis* in Barbados. *Leucotermes tenuis* is the species responsible for the serious injury to cane in St. Kitts, while the species of *Eutermes* attack cane plants in the field in Antigua and Porto Rico. Two species of *Calotermes* attack living trees—*C. balloui* being reported from cacao trees in Grenada, and from the heartwood of a *Pithecolobium* in St. Vincent, and *C. incisus* in the wood of a living avocado pear tree in Barbados.

Comte (—). **La Mouche du Chou.** [The Cabbage Fly *Chortophila* (*Anthomia*) *brassicae*, Bouché.]—*Rev. Agric. Vitic. Afr. Nord, Algiers*, xii, no. 101, 14th Feb. 1914. pp. 148-151, 2 figs.

This insect is a fly of the family Anthomyidae, the larvae of numerous species of which live in decomposing vegetable matter and occasionally in the digestive tracts of animals. In the adult stage they cause injury to the plants by sucking out the juices. According to A. Mazières, the cabbage fly caused serious damage to young cruciferous plants in Algeria during the autumns of 1911 and 1912. In Tunis, where similar damage is done, the author found that the bionomics of this insect differed greatly from that given by Mazières. Great variations also exist between Central and Northern Europe in this respect, since the climatic conditions are very different. The

* The localities for *E. acagutlae*, *E. costaricensis* and *E. sanctae-luciae* have been altered in accordance with a correction published in the *Agric. News* for 14th March, 1914, p. 90.

adult appears in autumn, and the female deposits about 50 eggs on the stems and on the lower parts of the petioles of the leaves. The larvae emerge about ten days later, and feed on the delicate young leaves. After about four weeks they pupate in the plant, or more often in the soil, and 15 or 20 days later, according to the temperature, the adults of a new generation appear. Usually there are three generations a year, the adults appearing in October, January and March. Metamorphosis is slightly retarded in winter, but is completely suspended in summer. Three or four larvae are sufficient to stop the development of a young cabbage ; the older plants are more resistant. This insect may be controlled to some extent by insecticides ; e.g., a mixture of 60 parts of lime and 30 parts of fresh pyrethrum powder, or a 12 per cent. emulsion of petroleum and water. These insecticides will not destroy the eggs nor the larvae, serving only to keep away the adults at the time of oviposition. The petroleum may be used on young plants which are not to be offered for sale for two or three months. In infested fields, plants containing larvae should be pulled up and burned.

Surface (H. A.). **Angoumois Moth.**—*Wkly. Zool. Press., Bull. Dept. Agric., Harrisburg, Pa.*, no. 257. 30th March 1914.

The Angoumois grain moth (*Sitotroga cerealella*, Ol.) occurs abundantly in Berks county, Pa. It lays its eggs on the wheat while in the straw and if wheat is permitted to remain unthreshed in the barn the moths infest it. Wheat threshed early is safe from attack. If at once placed in bins it can then be kept without serious damage except to the top layer, in which the pest can be killed by sprinkling carbon bisulphide over the wheat and covering with wet blankets.

Vuillet (A.). **Un ennemi du fraisier.** [An enemy of the strawberry plant.]—*Rev. Phytopath. App., Paris*, i. nos. 6 & 7, 20th Aug. and 5th Sept. 1913, pp. 97-98.

In June 1913, the Entomological Station in Paris received two specimens of a Tenthredinid larva injuring strawberry plants. From these *Cladius* (*Piophorus*) *padi*, L., were bred. Though not previously recorded, the presence of this insect on the strawberry is not surprising, as it feeds on many plants. Cameron states that the eggs are laid on the under side of the leaves, early in May. The very young larvae only attack the epidermis, but later on they make large holes in the stem and if present in numbers, considerable damage may be done. There are several (2–4 ?) generations in a year, the number probably varying with the locality. The nymphal stage, of the summer generation at least, is passed on the ground in a white cocoon spun among the dried leaves. The larva of *Cladius padi* is parasitised by *Tryphon lucidulus*, Hart., and *Ichneutes reunitor*, Nees. Spraying the under side of the leaves with nicotin or arsenic might be practised before flowering takes place and also after the crop has been picked.

Vargas Vergara (J. M.). **El mión.** [The froghopper (*Tomaspis bogotensis*).]—*Rev. Minist. Obras Publicas, Bogotá*, xii, nos. 10-11-12, Oct.-Nov.-Dec. 1913, pp. 470-472 and 547.

For years pastures in the Tocaima and Casasviejas region of Colombia have suffered from the ravages of an Homopteron of the genus *Tomaspis.* Specimens sent to the Imperial Bureau of Entomology have been determined as *T. bogotensis*, Dist., sp. n. The insect is known locally as *el Mión.*

Weldon (G. P.). **A case of arsenical injury to apricot trees.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii, no. 12, Dec. 1913. pp. 766-768, 2 figs. [Received 22nd April 1914).

It has been known for some time that arsenic applied to trees in the form of lead arsenate, Paris green, etc., for the control of insect pests, may accumulate at the crown of the root and a sufficient amount become soluble to corrode the bark and girdle the tree. The foliage becomes small and yellow early in the season; usually the crop is heavy and also highly coloured. Longitudinal cracks occur in the bark which may also be of an unnatural colour. In all cases the injury to the bark begins on the outer surface, and gradually eats its way through to the cambium. The wood, both of trees and roots, is more or less blackened, and, when injury is at all severe, girdling and death takes place.

A case of injury to apricot trees is noted from King's County. Early in the season climbing cutworms gave great trouble and the owner of the orchard heaped a mash of bran and Paris green about the root crowns of the affected trees. Later the orchard was irrigated and the trees soon became sickly, many dying outright. On 28th October some of the trees were still alive, but showed the characteristic symptoms of arsenical injury. It seems probable that alkali in the soil and water aided the breaking down of the Paris green, thus liberating soluble arsenic which damaged the trees. Orchard owners are warned to be moderate in the use of arsenic, and if there is any possibility of the formation of a collar of arsenic at the ground line, the soil should be removed, and with it the arsenic which unavoidably runs down the trunks in the process of spraying.

Vosler (E. J.). **Recent importations of beneficial insects into California.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii, no. 12, Dec. 1913, pp. 770. [Received 22nd April 1914].

The State Insectary received in August from Mr. H. A. Ballou, of the Imperial Department of Agriculture for the West Indies, a consignment of parasitised black scale material, from which were reared several hundreds of specimens of the predaceous egg parasite, *Lecaniobius cockerelli*, which have been liberated in an infested section, and the results are awaited with interest.

Professor S. I. Kuwana sent a consignment of mealy bug parasites from the Imperial Agricultural Experiment Station of Japan. Various species of hymenopterous parasites have been reared from this material, and they are now being bred in quantities for release in infested sections.

From the Philippines red scale infested with a small internal parasite was received, and also two consignments of black scales from which a Pteromalid egg parasite was obtained. Mr. C. H. T. Townsend sent parasitised black scales from Peru, from which several specimens of a large Encyrtid, which attacks old scales, were obtained.

Volser (E. J.). **Calendar of insect pests and plant diseases.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii, no. 12, Dec. 1913, pp. 772-775. [Received 22nd April 1914].

The author mentions the red-humped caterpillar, *Schizura concinna* S. & A. as requiring checking in December and January by hoeing and cultivating close to the fruit trees. The California tussock moth (*Hemerocampa vetusta*, Boisd.) is distributed throughout the central portion of the State, and is especially abundant along the coast. It feeds on the leaves and young fruit of the apple, as well as upon live oak, lupin, cherry and walnut, though the apple is the favourite. When caterpillars have been abundant during the previous season, the author advises handpicking the egg-masses from the limbs and trunks of trees in the late autumn. They should be destroyed by burning or immersion in oil.

Stabler (H. P.). **Red spider spread by winds.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii, no. 12. Dec. 1913, pp. 777-780, 2 figs. [Received 22nd April 1914.]

The author says that in the summer of 1912, a fruit-grower and nurseryman of Sutter County, became convinced from his own observations, that red spiders are carried by wind to a greater distance than is generally supposed. It has long been known that red spiders may be blown from one tree to another, or blown through several rows of trees, but it was generally supposed that a main road, a piece of open ground or similar barrier, was sufficient to prevent the spread of the pest by these means. The matter has been investigated by Mr. E. E. Munger of Yuba City, by placing a sheet of sticky paper on a board fastened to a fence twenty feet away from an infested tree. Twenty-four hours afterwards a great many spiders were found on the paper. On the 5th August a similar experiment was made and the paper was attached to a telephone pole twelve feet above ground, and one hundred feet to the north of a badly infested ten-acre almond orchard of very large trees. Numerous spiders were found next day. On the 10th August, a paper was placed 250 feet from the orchard and 30 feet from the ground and many spiders were found the next day. It was then removed to 650 feet from the orchard to the top of a school house, with the same results.

Experiments were repeated with precautions to preclude all possibility of the red spiders having reached the paper in any other way than by wind carriage. The results were again the same, and it is regarded as established that red spiders are blown sufficiently far to make infested orchards a menace to other orchards within reasonable distances.

Stewart (V. B.). **The Importance of the Tarnished Plant Bug in the Dissemination of the Fire Blight in Nursery Stock.**—*Phytopathology, Baltimore*, iii, no. 6, Dec. 1913, pp. 273-276, 1 pl.

Considerable attention has been given during the past few years to the dissemination of the fire blight bacterium (*Bacillus amylivorus*), in nursery stock, by various insects. Insects already recorded as of possible importance in this connection are *Aphis pomi*, and the following species of sucking bugs :—*Reduviolus ferus, Plagiognathus politusa, Platymetopius acutus, Empoasca mali, Typhlocyba rosae, Campylomma verbasci, Lygus pratensis, Orthotylus flavosparsus, Chlamydatus associatus, Cosmopepla carnifex* and *Siphocoryne avenae.* Among these the tarnished plant bug, *Lygus pratensis*, has appeared to be the most important in transmitting the blight parasite to healthy trees. During July 1913, this insect was very abundant on apples, and as a rule, the blight became more prevalent with their appearance. Experiments were made in order to ascertain to what degree the insect was responsible for its spread; it was shown that insects visting blighted tissue become smeared with the gummy exudation from the blight lesions and carry bacteria to the tender twigs; here, in sucking the sap, the insects puncture the tissues, thus forming a means of entrance for the blight germs, with the result that the twigs may soon become infected. These facts emphasise the importance of removing all blight infections as soon as they appear, as without the sources of infection, the presence of disseminating agents is not so important. Pears, as well as apples, have had the blight transmitted to them in this way.

Crawford (J. C.). **Descriptions of new Hymenoptera, nos. 6, 7, 8.** *Proc. U.S. Nat. Mus., Washington*, xlv, 22nd May, 1913, pp. 241-260; xlv, 22nd May, 1913, pp. 309-317; xlvi, 23rd Dec., pp. 343-352.

These three papers are systematic in character. The first includes a number of new species, the following being those of economic importance: *Bruchocida vuilleti*, sp. n., from Senegal; *Bruchocida orientalis*, reared from *Bruchus chinensis*, at Bangalore, India; *Coccidoxenus portoricensis*, sp. n., Porto Rico, reared from the "Wax Scale"; *Bruchobius laticeps*, Ashmead, bred from *Bruchus quadrimaculatus*, (no habitat given); *Bruchobius colemani*, sp. n., from *Bruchus chinensis*, at Bangalore; *Cassidocida aspidomorphae*, sp. n., reared from the larvae of *Aspidomorpha miliaris*, at Bangalore.

Most of the species described in the second paper are of economic importance. *Cercocephala atroviolacea*, sp. n., from New Mexico; *Derostenus agromyzae*, sp. n., from Indiana, U.S.A., host *Agromyza angulata*; *D. arizonensis*, sp. n., from Arizona; *D. variipes*, sp. n., from Indiana, *Agromyza pusilla*; *Entedon thomsoni*, sp. n., from Indiana, reared from *Agromyza angulata*; *Cirrospilus flavoviridis*, sp. n., from Utah, reared from *Agromyza*.

The third paper contains the results of an examination of a small, but extremely interesting collection from Trinidad, sent by Mr. F. W. Urich. Among the new species described are: *Telenomus tabanocida*, reared from Tabanid eggs; *Perilampidea syrphi*, reared from the larvae of a Syrphid preying on *Dactylopius citri*, found on cacao; and *Signiphora giraulti*, bred from *Dactylopius citri*.

Zappelli (P.). **Anche la "Mosca olearia" finalmente è vinta!** [The olive fly has at last been conquered.]—*L'Agricoltura Sabina, Poggio Mirteto,* xii, no. 12, 31st Dec. 1913, pp. 49-50.

The author states that efficient defence against the olive fly is provided by Professor Lotrionte's system of poison traps, called "capannette" (little huts) because of their shape. A sheet of tin, 14 inches by 10 inches, is bent into a V-shaped gutter which is inverted to form a roof for a bundle of dried olive twigs placed in the hollow and retained there by two galvanised iron wires. The ends of these are brought through the ridge of the roof and are then wound round the lowest horizontal branch of the olive tree requiring protection. It is necessary for some of the twigs to protrude from under the edges of the roof and also for the trap to be fastened very firmly to the branch to prevent it swinging about. Before fastening it, the twigs should be well wetted with the following mixture: Liquid glucose 50 to 60 parts, sodium arsenite 2 parts, boric acid 2 parts, borate of soda 2 parts, all by weight. One trap per tree is required where the tree has few branches and two traps where branches are numerous. If the system is adopted throughout the whole of an extended olive-growing region, one trap for every three or four trees may prove sufficient. Care must be exercised to avoid spilling or dropping the mixture on the leaves and branches of the tree. The mixture must be re-applied about five times during the season by means of a spray pump, with careful attention to avoid spilling. In an experiment which was carried out on about 1,500 trees, the traps were placed in position in the end of June and beginning of July. The five renewals of mixture were made on the following dates:—From 15th to 16th July, 6th to 8th August, 25th to 27th August, 8th to 10th September, 2nd to 5th October. To check results, "control" olive groves were chosen adjoining, but higher up the slope than the plantations treated. As the fly prefers low-lying areas, the control plots were in a more favourable position than the others. Yet of the olives gathered from these trees, from 30 to 50 per cent. were infested and the olives which had fallen on the ground showed a percentage of 80 to 90. In the protected plantations these figures were respectively 1 to 2 per cent. and 4 to 5 per cent. Proceeding to the store-room, a handful of olives from the control trees and another from the treated ones, were taken from the heaps, and whereas the first had 50 per cent. of the fruit damaged the others were quite perfect. The grower had also sprayed the crown of the treated trees with acid Bordeaux mixture containing 1 per cent. lime and 1½ per cent. copper sulphate, with the twofold aim of combating *Cycloconius* and of hardening the olive skins and thus rendering it more difficult for the fly to pierce them; the same spray was used—though to a less extent—on the control trees. The attack of the fly also occurred this year at a very late date—in October—when the fruits were already about to ripen. Thus the results attained are entirely due to the new system. In another district the same experiment was made on over 1,500 trees and with practically identical results. The problem may, in the author's opinion, be considered solved.

Dalmasso (G.). **Un metodo singolare di lotta contro le tignuole dell'uva.** [A doubtful method of combating the vine moth.]—*Riv. Vitic. Enol. Agrar., Conegliano,* xx, no. 1, 1st Jan. 1914, pp. 6-10.

Experiments made at the Government Enological School at Conegliano go to support the view advanced by Moreau and Vinet [*c.f.* this *Review,* Ser. A., ii, p. 16] that vine moth control by capture in wine-traps is unsatisfactory. The author concedes that weather conditions were mostly unfavourable, but ill-success cannot be wholly ascribed to this cause, and, in any case, a method which depends so much on suitable meteorological conditions is a very uncertain one at best, as the expense for material and labour is considerable and the traps may be washed out several times in a month by rain. During the month of July 1913 alone, at Conegliano, no less than 5½ inches of rain fell, distributed over 16 days; the traps were either completely washed out or the liquid so diluted as to be useless, and generally there was such a development of mould that the liquid rapidly ceased to attract.

Foucher (G.). **Cecidomyid Flies attacking Willows.**—*Bull. Soc. Nat. Acclimat., Paris,* lxi, no. 1, 1st Jan. 1914, pp. 23-26.

The habits are recorded of two willow-feeding Cecidomyias of the genus *Rhabdophaga, R. rosaria,* H. Loew, and *R. pulvini,* Kieff. The former lays its eggs on the tips of the branches, causing a cessation of growth, and the larvae develop in galls forming a terminal rosette. The larva of *R. pulvini* lives in the pulvinus of the leaf, where its presence is indicated by a swelling. Infested branches wither and dry completely. In spite of their small size, these two Cecidomyias sometimes cause considerable damage in osier plantations, where they chiefly attack *Salix purpurea, depressa, aurita* and *cinerea.* The only preventive measure is to remove the infested branches and carefully burn them.

Shtchedritzky (—). **О поврежденіяхъ озимыхъ всходовъ.**—[On injuries to the shoots of winter-sown grain.] **«Сибирское Сельское Хозяйство.»** [*Agriculture of Siberia.*] *Tomsk,* Jan. 1914. pp. 4-5.

The author warns agriculturists of the district of Tomsk, against injuries to their winter-sown crops which may result from the activities of larvae of *Euxoa segetum.* These insects appeared in some parts of the district last autumn and it is likely that, after hibernation, they will again cause damage till about the end of June. To protect the crops from further injuries he suggests harrowing the fields on which the pests appeared last autumn, as soon as the ground thaws, and digging trenches round the areas that were stripped. To prevent damage to autumn shoots he recommends ploughing the fields for the winter crop as early as possible, in any case before June, and subsequently making round the fields a trench about 8–9 inches deep and of the width of a spade; frequent harrowing is advised to prevent the growth of weeds. The author concludes with a brief description of the larva and perfect insect.

KOSTAREV (N.) **О борьбѣ съ плодожоркой.** [The fight against *Cydia* (*Carpocapsa*) *pomonella*, L., and *Cydia* (*Grapholita*) *funebrana*, L.]—**«Плодоводство»** [*Fruit-Growing*], St. Petersburg, Jan. 1914, pp. 32-38.

This is a paper read by the author at the general meeting of the Russian Imperial Society of Fruit-Growing in December last. He refers first to the enormous amount of damage done by *Cydia pomonella*, which injures as much as 60 per cent. of the apples in the Crimea, while in the governments of Astrachan and Ekaterinoslav and elsewhere, the figure amounts to 90 per cent., thus causing yearly a loss to fruit-growers estimated to reach millions of pounds sterling. While not disputing the importance of the principle of fighting the pest by means of its parasites, the author considers that this method has not yet given practical results in the orchard. He points out the good results obtained in America by means of spraying, and advocates the methods suggested by Dr. Ball and Professor Melander, *i.e.*, spraying under high pressure and directed downwards [see this *Review*, Ser. A., i, p. 276]. He then goes on to deal with *Cydia funebrana*, the damage done by which is more indirect than direct, for its attacks induce the development of the fungi, *Monilia fructigens* and *M. cinerea*.

He further gives an account of some experiments conducted in Sotchi, where *C. funebrana* starts ovipositing after the 14th May. Bordeaux mixture and lime-sulphur, which are so effective against the fungus *Phyllosticta prunicola*, proved less so against *Monilia*. About 12 pints of kerosene emulsion to 10 gallons of Djipsin gave good results, but this insecticide is too expensive ; the cost per tree was 14s., as the spraying had to be repeated every 10 days, *i.e.*, 14 times during the summer. A casual observation, that in orchards in which the quantity was too small to be worth harvesting, the plums were less damaged, has led to further investigations which proved that, in orchards where no harvest was obtained one season, the plums were healthy the next year ; while in orchards which yielded a good crop one year, the next was considerably diseased with *Monilia*, and the third was altogether ruined. This is explained by the fact that the majority of *C. funebrana* live only one year, and if the next generation finds no food owing to a bad harvest, it dies out ; the moths do not fly far and the greater the area affected by a total bad harvest, the less likely are they to appear next year. This led the author to try to prevent a harvest in plum orchards artificially once in every three years, by burning the blossoms of plum trees with sulphate of copper ; as a result, splendid plums were obtained and the yield increased, for having had a year of rest, the trees bore a heavier crop.

In summarising his remarks the author recommends the following campaign against *C. funebrana* :—(1) The blossoms of plum trees ought to be burnt with sulphate of copper once in three years, or in a third of the orchard every year, which remedy destroys also many fungus diseases ; (2) during the winter and early in spring the withered fruits must be collected and destroyed ; (3) the earth in the orchard must be kept friable till the fruits acquire their normal colour ; (4) the plums which turn red at the beginning of summer, when the bulk of the plums are still green must be removed and destroyed, as well as all rotten fruit ; (5) the following spraying operations are advocated :

(*a*) Before the unfolding of the flower-buds, spray with Djipsin (about 2 lb. in about 46 gals. of water) as a remedy against *Rhynchites* and with Bordeaux mixture (4 lb. of lime and 4 lb. of sulphate of copper in 46 gals. of water) against *Monilia*; (*b*) during the time of blossoming, spray with weak Bordeaux mixture to prevent the growth of *Monilia*, this liquid being quite harmless to bees; (*c*) immediately after the petals have fallen off, spray with djipsin and kerosene emulsion against *C. funebrana* and other pests, and with Bordeaux mixture against *Monilia*; (*d*) 15 days after that, spray again with weak Bordeaux mixture, which must be repeated in the first half of July and again in August; (*e*) if Aphids should appear spray with tobacco extract before the leaves begin to curl.

**La *Diaspis pentagona* ed il modo di combatterla.** [*Aulacaspis* (*Diaspis*) *pentagona* and the method of combating it.]—*L'Agricoltore pratico, Genoa*, vii, no. 1, Jan. 1914, pp. 5-6, 7 figs.

The endophagous parasite, *Prospaltella berlesei*, How., has proved of great value in controlling the mulberry scale. In Italy, huge trees entirely covered with *A. pentagona* were completely freed in 18 months. The female Chalcid pierces the Coccid with her ovipositor and deposits an egg in its body. The larval, and sometimes the nymphal, stage of the parasite is passed in the body of its victim, which is devoured until only the skin is left. The scales killed thus assume a bright red brick colour and become transparent and fragile, which is not the case when death is natural. This is a useful indication. *Prospaltella* has four to five generations in a year, all the offspring being females, which lay about a hundred eggs each.

Gourley (J. H.). **Spray Calendar for New Hampshire.**—*New Hampshire College and Expt. Sta., Durham, Extension Circular*, no. 10, Jan. 1914, 12 pp. 3 figs.

The actual spraying tables are preceded by spray formulae, with full instructions for their preparation. With these is given a three-column dilution table. The first column shows the strength of lime-sulphur solution expressed in Beaumé degrees, the second the corresponding number of gallons of water required to dilute 1 gallon of lime-sulphur for dormant spray, and the third the corresponding number of gallons for summer spray. For instance, to make up a dormant spray, 2 gals. of water should be mixed with 1 gal. of lime-sulphur of 15° B., or 8 gals. water with 1 gal. of 33° B.

Pratt (H. C.) and South (S. W.). **Progress Report on Locust Work to November 30th 1913.**—*Agric. Bull. F.M.S., Kuala Lumpur*, ii, no. 6, Jan. 1914, pp. 152-156.

So far as can be ascertained, locusts are still confined, in the Federated Malay States, to the States of Selangor and Negri Sembilan. Many swarms of hoppers have been reported from Malacca territory, but none as yet from Pahang. No northerly advance has been made since the last generation. In Selangor during November, there have been no hoppers and the number of swarms decreased from the beginning of the month onwards, swarms probably joining forces.

Egg-laying is expected to commence shortly and the breeding-grounds are being carefully watched. In Negri Sembilan during October and November, the swarms were very numerous and individually small. The periodicity which is so marked a feature in the alternation of fliers and hoppers in Selangor is not so marked in Negri Sembilan, and both have been present all the time. The area of distribution here is very wide, and help has been given in the work by assistants from Selangor. Most locusts have been destroyed by the sheeting and bag-trap method [see this *Review*, Ser. A., ii, p. 110]. For the locusts in paddy small quantities of crude oil or kerosene were poured on the water in the flooded sawahs and the hoppers shaken off the paddy into the oil by means of long bamboos. Many swarms were wiped out by this method. A large number of breeding-grounds were reported from Malay kabuns and estates. Wherever it is possible to flood a breeding-ground, this is the most effective way of destroying the unhatched locusts. A note is made of the necessity of notifying an Inspecting Officer of the presence of locusts on any land as stated in Section 13 of "The Agricultural Pests Enactment, 1913." Only by thorough co-operation of all the planting community will it be possible to make a success of the present locust campaign. Rewards are still offered for reporting breeding-grounds, swarms of first instar hoppers and swarms of 2nd to 5th instars. The report closes with a summary of the locust destruction in Negri Sembilan in October and November, the totals collected being respectively 293 and 1,836 kerosene tins full of these insects.

**È questo il momento buono per combattere il pidocchio lanigero del melo.** [This is the proper time to combat the woolly apple aphis.]—*L'Umbria verde, Spoleto*, iv, no. 1, Jan. 1914, pp. 10-11.

For winter treatment, a solution of 2 parts by weight of carbolised tobacco extract and a like quantity of carbonate of soda in 100 parts of water, or 1 part of soap and rather less than 1 part by weight of petroleum in 100 parts of water are recommended. The waxy covering may be brushed with a mixture of linseed oil 7 parts, white lead $1\frac{1}{2}$ parts, zinc oxide 1 part, all by weight, which is boiled for 10 minutes, to which when cold is added 1 part of turpentine. A newly introduced method consists of burying calcium carbide, in pieces the size of a walnut, in holes made round the tree. If the soil be damp, the too rapid generation of gas may be prevented by wrapping the carbide in paper.

CERRIANA (E. F.). **Come si combatte la fillossera.** [How Phylloxera is combated.]—*Consigliere dell' Agricoltore, Turin*, ii, no. 1, 15th Jan. 1914, pp. 20-21.

If in spite of every care, Phylloxera has gained a footing in the vineyard, bisulphide of carbon may be used against it. A dose of 10 oz. per square yard will destroy, not only the pest, but also the vine, whereas one of $\frac{3}{5}$ to 1 oz. will destroy all, or nearly all, the pests without injuring the plant. In view of the fact that success is not quite certain and that costs are high, this method is most suited for a vineyard where only a few plants are infested. Flooding gives very good results, but is not applicable in the majority of cases, nor is planting in sand satisfactory. The only method which is really feasible is the replanting with resistant American stocks.

Cooley (R. A.). **The Alfalfa Weevil.**—*Montana Agric. Expt. Sta., Bozeman, Circ.* 35, Jan. 1914, pp. 191-206. 7 figs, 2 pls.

The alfalfa weevil occurs in Europe, Western Asia and Northern Africa. The attention of the Utah Experiment Station was not called to it until 1907, but it has now spread over many counties in that State and the damage it causes may range from a loss of 25 per cent. to complete destruction of the crop. Early in the spring the hibernating adults emerge and in a few days lay eggs in holes, which they make in the stems of the alfalfa. While the stems are young the beetles feed on them, but when they are older and harder, the weevils feed on the softer epidermis of the stalks and leaves, and may completely defoliate the plants. The eggs hatch in from seven to sixteen days, and after about a month, pupation takes place; about two weeks later the perfect beetle appears. By about 1st August, the beetles have completed their feeding and have crawled or flown away, and for the most part, they pass the winter near the ground hidden in waste material, or buried in the ground. The so-called "spring flight" begins in April; about the 1st July is another period of great activity known as the "summer flight." It is advisable to stimulate the first crop to rapid growth by cultivation, so that it may be harvested just before the larvae would do their maximum damage. The removal of this first crop leaves a nearly bare field. Irrigation should be delayed and the field should be cultivated and brush-dragged.

In shipments examined before quarantine came into operation, weevils were found in three loads of potatoes, which contained 8, 10 and 12 living weevils respectively. There is now an Act to provide for the prevention of the introduction and spread of insect pests and diseases of horticultural and agricultural plants. Under this Act, on 12th September, 1913, the importation into Montana was prohibited of alfalfa hay, forage crops of all kinds, whether loose or baled, alfalfa seed and all nursery stock (unless accompanied by a certificate of fumigation), and fresh fruit and vegetables of all kinds, during the months from April to October, inclusive, from the State of Utah; except that fruits and vegetables may be moved into Montana from Utah on and after 1st August of each year under special conditions regarding packing. The quarantine is in force only during the season of the year when the adult weevils are active, and by this means it is believed that the greater part of the danger of introducing this pest is removed.

Burgess (A. F.). **The Gipsy Moth and the Brown-Tail Moth, with Suggestions for their Control.**—*Farmer's Bull. U.S. Dept. Agric., Washington, D.C.*, no. 564, 29th Jan. 1914, 24 pp., 10 figs. [Recd. 14th April 1914.]

The gipsy moth feeds on apple, oak, grey birch, alder, willow, beech, poplar, pines and other conifers, apple and oak having suffered most severely. These trees may be defoliated to such an extent as to cause their death. The brown-tail moth commonly feeds on apple, pear, plum, oak and willow, and may be found on elm, maple and rose; it never attacks conifers and is seldom found on ash, hickory, chestnut or birch. Natural enemies are proving very valuable in checking these

pests and parasites are now being imported into America. The enemies which are at present destroying the largest number of gipsy moth caterpillars and pupae, are a Calasoma beetle (*C. sycophanta*, L.), a Tachinid fly (*Compsilura concinnata*, Mg.), and *Apanteles lacteicolor*, Vier. Two species of egg-parasites imported from Japan, *Schedius kuvanae*, How., and *Anastatus bifasciatus*, Fonsc., are also proving of great value. These parasites and enemies, with the exception of the egg-parasites, also destroy the brown-tail moth. *Meteorus versicolor*, Wesm., attacks the latter, but not the gipsy moth.

Among the methods of control recommended for the brown-tail moth is the cutting off of the winter webs and burning them before the caterpillars begin to emerge in April. Spraying in the spring is not a satisfactory method since there is not sufficient foliage to hold the spray. The most effective measure is to spray the trees before the middle of August, using from 6 to 10 pounds of arsenate of lead to 100 gallons of water. One of the best methods of controlling the gipsy moth is to treat the egg-clusters of the insect between 1st August and 1st April with creosote, to which a small amount of lampblack has been added. This mixture is applied with a brush. Burlap and tanglefoot bands are also recommended. The most effective spray for the gipsy moth is arsenate of lead paste applied to the foliage at the rate of 10 lb. to 100 gallons of water, by means of a high power spray in the case of large shade trees. In orchards, early spraying will be sufficient where few egg-clusters are present, or where the infestation is more serious, a second spray in June will be found satisfactory. All poor or hollow trees should be removed, and if near an infested woodland, the trees should be banded with tanglefoot. In cities and towns the same methods can be used, but they will not satisfactorily control the gipsy moth in woodland areas. The treatment of such areas is made more difficult by the fact that they are composed for the most part of several species of trees. Sometimes practical methods of thinning can be adopted so that those species will be left that are only slightly subject to injury by these insects ; but the protection of woodland is a problem needing much study and investigation. The damage caused by the brown-tail moth is ordinarily not so severe as that resulting from gipsy-moth infestation, and elimination of oak, scrub-apple, and wild cherry trees greatly assists in reducing the numbers of this pest. Each of the New England States is carrying on work for the control of these insects, a State official being in charge. A brief summary of the conditions of infestation in each State is given with a statement of any special lines of work that are being attempted. The work carried on by the Bureau of Entomology of the United States is designed to check the spread of these insects, and in order to obtain better methods of control the programme includes a thorough study of the food-plants, the feeding habits in the various stages, the rate of increase in the field, the means by which the insects are spread, the introduction and distribution of foreign parasites and natural enemies, and a study of the wilt disease. Silvicultural investigations and scouting work are being carried on to a large extent and this serves to establish the quarantine line. Various parasites have been liberated in all the New England States, and records show that the control work is meeting with a large amount of success.

**Contra el bicho moro.** [Control of the black (Meloid) beetle.]—*Gaceta Rural, Buenos Aires*, vii, no, 78, Jan. 1914, p. 525.

This insect belongs to the family MELOIDAE and is ½ to ⅝ of an inch in length, with a blackish conical body, covered with light grey pubescence The perfect insect feeds on the leaves of the potato, tomato, and other solanaceous plants and devours them with such voracity as to strip the fields in a few days. The female oviposits on the ground and the primary larvae emerge in 20 or 25 days. These larvae are active and move about in search of food. When full fed they assume the second sedentary form, their shape altering as they approach the pseudochrysalis stage, in which they pass the winter. From this pseudochrysalis another larva emerges in spring and pupates in a few days, the imago emerging after an interval of 8 days.

The destruction of the beetle may be effected in various ways. The rows of attacked plants may be gone over with a large broad tray into which the insects may be shaken from the plants. This must be done early in the morning and is not much more costly than the use of arsenic, if suitable labour is cheap. The second method is to spray with Bordeaux mixture or other cupric solution. The applications must be made immediately the first insects appear. The addition of 1 part of lysol to 1,000 parts of the mixture is useful. The third method is the employment of copper arsenate in liquid form, 4 oz. being dissolved in 22 gals. water. If of cheap quality, the quantity may be increased up to 8 oz.

MURANIA (G.). **Bianca rossa** (*Chrysomphalus dictyospermi* var. *rinnulifera*, Mask.).—*Rinnovamento economico-agrario, Trapani*, viii, no. 1, Jan. 1914, pp. 7-9.

The author states that the Agricultural Station at Messina has worked out the cost of lime-sulphur for each citrus tree at just under 3 pence for winter treatment and a little less for spring treatment. In the United States, hydrocyanic acid fumigation is practised at a cost of 20 pence per tree, each tree bringing in a net revenue of over 17 shillings. Spraying with lime-sulphur is only of use when the larvae are naked, as the adults have a thick skin which protects them from it. A simple guide is provided by a bottle in which some attacked twigs or leaves are placed in January, May, or August, and daily examined by transmitted light until minute insects are seen wandering on the sides. The appearance of these larvae indicates that the favourable moment for operating has been reached. Of the enemies introduced for control purposes, the Coccinellid beetles, *Chilocorus kuvanae* and *Rhizobius lophantae*, seem efficacious.

ZIMMERMAN (H.). **Einige Beobachtungen über die Johannisbeergallmilbe** (*Eriophyes* (*Phytoptus*) *ribis*, Westwood) **an** *Ribes alpinum* **in Mecklenburg.** [Observations on the currant gall-mite in Mecklenburg.]—*Archiv. des Ver. der Freunde der Naturgeschichte in Mecklenburg, Rostock*, lxvii, pt. 1, 1913, pp. 130-136.

The currant gall-mite (*Eriophyes ribis*) is a pest of currants (*Ribes rubrum* and *R. nigrum*) of widespread distribution, and occurs in the neighbourhood of Rostock, Mecklenburg, on *Ribes alpinum*. Eggs are laid

from January onward, and the young mites appear in March. Among the enemies of this mite are Coccinellid larvae, particularly those of *Coccinella septempunctata*, the hymenopterous parasite *Tetrastichus eriophyes*, and the fungus, *Botrytis cinerea*. If the infestation is slight the buds which are attacked may be removed and burned in December and onwards ; if the infestation is great, the whole bush should be burned. Collinge recommends dusting the bushes with a mixture of 1 part lime and three parts sulphur ; the dusting should be done at the end of March or beginning of April and should be repeated at intervals.

TURREL (A.). **Les Traitements Arsenicaux en Agriculture.** [Arsenical Treatment in Agriculture.]—*Rev. Vitic., Paris*, xli, no. 1051, 5th Feb. 1914, pp. 150-152.

The author disputes the idea brought forward by M. Cazeneuve, that arsenical treatments are of little value in agriculture. On investigating cases where such treatments have apparently failed, it has been found that either the application has been badly made, or else at the wrong time. Where the application has been made with care, the results have been quite satisfactory. The author has treated 500 acres of vines with arsenates with complete success. The loss was only about 10 per cent., whilst in the neighbouring vineyards 66 per cent. of the harvest was lost. This has been his experience for about three years. In Bouquignau (Aude), *Clysia ambiguella* destroyed about 95 per cent. of the fruit just before gathering, but the following year by use of arsenates, the author was able to save it completely. Arsenical treatments prepared and applied according to the methods recommended by authorities, are of the greatest value to agriculturists, and if the necessary precautions are taken, no danger is involved in their use.

*Cephus pygmaeus* **attacking Cereals in North Africa.**—*Bull. Soc. Nat. Acclimat., Paris*, lxi, no. 4, 5th Feb. 1914, pp. 122-123.

M. Rivière complained of the rapid multiplication of a sawfly, *Cephus pygmaeus*, which causes great damage in North Africa. The female pierces the stem of any cereal and deposits an egg in the hole. This process is repeated fifteen to twenty times. The larva emerges very soon and rapidly bores its way into the middle of the stem, in the lower part of which it winters as a pupa. After the crop has been cut, the stubble should be burnt, thus destroying numerous pupae. The question whether *C. pygmaeus* can maintain itself on wild grasses requires investigation.

HUGOUNENQ (L.). **La bouillie sulfo-calcique.** [Lime-sulphur mixture.] —*Progrès Agric. et Vitic., Montpellier*, xxxi. no. 6, 8th Feb. 1914, pp. 186-188.

The author points out the difficulties in the preparation of lime-sulphur for a good spray and subscribes to a suggestion of L. Degrully, that a simple way of attaining this end is to replace the lime-sulphur by the alkaline polysulphides produced commercially. He holds that where lime-sulphur is efficacious—as it must be when properly prepared—the alkaline polysulphides will be no less so. Like the lime-

sulphur mixture, which is only an undefined polysulphide of calcium with sulphurous and sulphhydric compounds, the alkaline polysulphides soluble in 2 parts of water act by their causticity and by the sulphur they deposit on the affected parts. This sulphur is extremely active, as it is in a nascent state. The polysulphide in concentrated (20–25 per cent.) solution keeps almost indefinitely. It only requires diluting with water to yield solutions of 1, 2 or 5 per cent. as required at the very moment of application. The author questions whether it is worth while carrying out delicate operations to obtain an unstable and even dangerous product, when the commercial article is of constant quality and needs nothing more than dilution for use.

Borodin (D.). **Работы по борьбѣ со вредителями и болѣзнями садовъ въ Мартѣ.** [Control measure to be taken against pests and diseases of orchards in March.]—**«Хуторянинъ»** [*Chutorianin*], *Poltava*, 26th March 1914, pp. 333-336, 2 figs.

The author calls the attention of Russian fruit-growers to the necessary preventive measures which must be applied in their orchards during March. He first recommends the destruction of various wintering pests, such as caterpillars of *Aporia crataegi*, *Euproctis chrysorrhoea* and *Cydia pomonella*, and the eggs of *Rhynchites*, *Malacosoma neustria*, *Lymantria dispar* and others. He figures the nests in which the caterpillars of *Aporia crataegi* winter and the lines of eggs of *M. neustria*, and gives in every case information as to how to get rid of the pests. He suggests also the removal and destruction of all withered fruit, which has been left on the trees, as this fosters various fungus diseases, *Monilia* etc. As a protection against scale-insects, he recommends smearing over the attacked parts with California mixture, [see this *Review*, Ser. A. ii, pp. 209-10] and with carbolineum, which latter however can only be applied to trunks and thick branches, for the thin branches and shoots are injured by it. He remarks that Scalecide and some other remedies against scale-insects have not yet been tested sufficiently.

**Rept. Dept. Agric. Union of S. Africa,** 1st Jan. 1912 to 31st March 1913, *Cape Town*, 1913. [Received 25th Feb. 1914.]

*Aspidiotus hederae* appeared again on one or two olive trees and the apple and pear trees will have to be treated with lime-sulphur wash next winter for greedy scale (*Aspidiotus rapax*). Olive bug has been less abundant, but has necessitated spraying with McDougall's dip at least once a month. Fruit fly was in evidence, but was kept well in hand with arsenate of lead spray. Among the specimens of vine pests sent in for diagnosis, Dr. Perold found *Phylloxera* and mealy bug. Mr. C. W. Mally, the Cape Province Entomologist, reports on the olive fly parasites. During May and June five lots of olives, presumably infected by maggots of the olive fly, *Dacus oleae*, were sent to Dr. F. Silvestri at Portici, Italy, for the purpose of establishing the South African parasites of this fly in Italy. The results appeared to be negative. Also during April, May, June and July nine lots of black scale (*Saissetia oleae*) were sent to California in order to establish the South African parasites of this scale-insect in America. The

Australian Bug (*Icerya purchasi*) caused considerable trouble at Orchard Siding, especially on Winter Nelis pear trees. Although several colonies of *Vedalia cardinalis* were distributed there, they seemed of little value, and the trees were sprayed during the first week in July with Scalecide. Examination later on in the month showed that the strongest spray (1 : 16) did not completely penetrate the egg-masses, except those that received the full force of the spray. This suggested the idea of "progressive penetration," but this was found to injure the buds and twigs. The Buchu beetle, *Ablabera hottentota*, was the subject of serious complaint during August, owing to its depredations on young buchu seedlings near Piquetberg. Owing to their continually coming in from the veld and the small size of the seedlings, spraying was considered useless, and therefore every plant was protected by a small cap of wire guaze. At Stellenbosch the strawberry ground beetle did serious damage by eating into the half-grown to fully ripe berries. There were hundreds of larvae and pupae in the soil and it was proposed to try and poison the beetles by means of poisoned bait. Strawberry plants were also attacked by the strawberry weevil, (*Eremnus*) the larvae of which fed on the underside of the leaves. A spray of 1 lb. arsenate of lead in 25 gallons of water gave good results. This insect is also known to have other food-plants besides the strawberry, since they were found on matted grass and on old weed roots. The maize stalk-borer (*Sesamia fusca*), was the subject of an inquiry, but the greatest loss in this case was found to be due to a beetle (*Heteronychus arator*), cutworms and yellow stalk-borer (*Sesamia vuteria*). *Heteronychus* especially proved a serious pest; toads and birds were found to devour them, but arrangements were made to try poisoning the beetles with bait. The lucerne *Tylenchus* has been at work for three or four years, but the lucerne holds its own, for the worm disappears as the hot weather approaches. The grain bug (*Blissus diplopterus*, Dist.) was very abundant in the wheat lands in the Piquetberg district during the last week in August, but disappeared after some heavy rains. A weak arsenical sweet was recommended for use against the Argentine ant (*Iridomyrmex humilis*) and seemed to prevent this insect being a nuisance, but it increased rapidly as soon as the laying of the poisoned sweet was stopped. The grape-bunch spider also proved a nuisance to one grower. He had been hand-cleaning the bunches and no better measure could be suggested. If fumigation for vine mealy bug during the winter months proves a success, it may also destroy the winter stage of this spider. The pernicious scale (*Aspidiotus perniciosus*) has not yet been found in this Province.

A report is also made on nursery inspection, and it is stated that a large increase in this work has taken place. The Union legislation, in respect of traffic in plants, admits of much more effective control over nurseries than was practicable under any of the colonial laws. In the period under review 388 nurseries were registered. No nursery is known to be infested with San José scale. Of the pests on account of which quarantines would be imposed, the red scale (*Chrysomphalus aurantii*) is by far the most widespread, and no nursery with citrus stock was found to be absolutely free from this pest. The purple (*Lepidosaphes beckii*) and mussel scales are bad pests in some parts of the country. The former species most unfortunately has become

common as a palm pest. The Ross scale (*Chrysomphalus rossi*) has even greater potentialities as a pest and much trouble is being experienced in the prevention of its spread. Hedge plants are especially attacked by it and it is feared that this pest will attack the magnificent stretches of Australian myrtle (*Leptospermum*). The nursery control service is also endeavouring to hold back the pustular scale of the oak (*Asterolecanium variolosum*). The chaff scale (*Parlatoria pergandii*) and *Aspidiotus dictyospermi* are other potential pests found during nursery inspection. Twenty-seven nurseries were quarantined during the financial year 1912–1913.

References are also made to the plant and potato import regulations. Few of the plants imported during the period under review were found to be infested with pests. However *Lepidosaphes ulmi* (oyster-shell scale) was found a few times, and once in considerable numbers, and a gross infestation by *Aulacaspis rosae* (rose scale) was found on some blackberry plants consigned to a nursery. Neither of these scales is known to occur anywhere in South Africa. Among the fruit inspected, San José scale was in abundance on some Californian pears. During this period the sorting of imported potatoes has been supplanted by fumigation in formaldehyde gas. The chambers at Cape Town were made 14 feet square and 8 feet high, and the cases were stacked three or four high, with about three inches of clear space all round them. The chambers were built with two wide doors one opposite the other and the charge of chemicals divided between two buckets. The charge consisted of 48 fluid oz. formaldehyde solution (nominally 40 per cent.) and 24 avoir. oz. of permanganate of potash crystals. The crystals were placed in the bucket and the liquid added. In about half the treatments, the exposure was overnight and the rest was generally four to five hours. No injuries to the potatoes were experienced by this treatment. No contraventions of serious importance of the "Codling moth Regulations" have been reported. As a result of the "Plant Removal Regulations", two rather large consignments of oak trees, infested with the pustular oak scale, were prevented from being despatched from Johannesburg to distant centres, and the finding of the ordinary red scale on fruit trees, roses and vines was of common occurrence. A detailed statement of the occurrence of San José scale is given, and precautionary measures are being taken to check the dissemination of this pest. Migratory locusts gave no material trouble in any part of South Africa during the period covered by this report.

YOTHERS (M. A.). **The peach twig-borer. An Important Enemy of Stone Fruits.**—*Washington State Agric. Expt. Sta., Pullman, Bull.*, no. 61, 10th Feb. 1914, 4 pp., 5 figs.

Known in the United States since 1860, when it was introduced with the peach from Western Asia, the peach twig-borer or peach worm, *Anarsia lineatella*, Z., causes considerable damage not only to the peach, but to other stone fruit, such as prunes, apricots, nectarines, plums and almonds. The larvae hibernate in small silk-lined cells just beneath the surface of the bark, and located within the forks of small twigs. About the time the peach trees bloom in the spring, the young larvae emerge and, after a couple of days, eat their way into the tips of the

twigs. They not only eat the buds, but penetrate into the pith of the small twigs, causing the leaves to wilt and droop. One larva injures several twigs, and if infestation be severe, the tree may be killed. The second and third broods of larvae attack the fruit; they sometimes feed entirely in the flesh of the fruit, but often enter the stone. The pupal stage of the first brood is passed in crevices of the bark on the trunk of the trees, or under rubbish on the ground, etc. The adult is a tiny grey moth. The second and third broods of larvae pupate mostly in the creases at the stem end of the fruit. The eggs of the first brood are laid on the base of the petioles or stems of the leaves, those of the second on the fruit, while those of the third are laid in the crevices of the bark in the forks of new and old growth.

This pest is subject to control at least twice in its seasonal life. It can be reached by a contact spray while in its cell beneath the bark, and it can be killed by a stomach poison when it begins feeding upon the leaf bud in the spring. The contact poison should be applied just before the buds swell in the spring. The later the application is made before the buds open the better. Spraying for the San José scale will also control the twig-borer, if started as late as possible when the buds begin to swell. Thoroughly applied lime-sulphur solution is considered to be the best treatment for the twig-borer. Crude oil emulsion has not been tested thoroughly against it, but in view of the perfect results obtained with this preparation against the San José scale, it appears to be a very promising remedy for the borer. Kerosene emulsion has been supplanted by lime-sulphur. Lead arsenate (1 lb. in 50 gals. water) is effective when the over-wintering larvae begin feeding on the young buds in spring, but as the buds grow quickly, the poison is effective for only a few days, after which it must be renewed. Many of the larvae and pupae can be caught by banding the trunks as for the codling moth, and the bands should be examined weekly during the season. In the author's opinion, where regular spraying for the San José scale (either with lime-sulphur or crude oil emulsion) is practised each year as stated above, the injury of the peach twig-borer will be reduced to a minimum and further treatment usually unnecessary.

MAISONNEUVE (P.). **Le Froid et les Insectes Parasites de la Vigne,** [Cold and Insect Pests of the Vine.]—*Rev. Vitic., Paris*, xli, 12th Feb. 1914, pp. 179-182.

Numerous observations have proved that many insects can resist intense cold, and *Clysia ambiguella* and *Polychrosis botrana* are capable of resisting very low temperatures. It seems as if warm wet winters are more detrimental to these insects, for under these conditions, fungi develop and attack the pupae. Decortication is carried out in some vineyards and by this means many pupae are destroyed, but owing to the unprotected condition of the vines during winter, a great loss often results from this measure.

MORRIS (O. M.), HALL (J. G.), & YOTHERS (M. A.). **Potato-growing in Washington.**—*Washington State Agric. Expt. Sta., Pullman, Popular Bull.*, no. 62, 15th Feb. 1914, 39 pp., 18 figs.

Of the insects affecting potatoes in Washington, the potato flea-

beetle was one of the most serious pests in 1913, not only on account of the direct injury caused, but because that injury affords a point of entrance to the fungous disease of the potato, known as early blight. The most effective treatment for this insect is to spray the plants with Bordeaux mixture. The latter serves merely as a repellant. Wire worms primarily infest grass, but are not adverse to feeding upon potato tubers and often do considerable damage by boring through them. The best method of control, so far devised, is autumn ploughing to destroy the over wintering pupae in their cells in the ground. Cut worms are not especially fond of potatoes, but often do considerable damage. No method seems to give perfect control results, but clean culture is one of the most effective remedies and if consistently followed, will give a good measure of success. A very common and effective treatment is to poison the worms with the poisoned bran mash recommended for grasshoppers. Several species of grasshoppers injure the potato by destroying its leaves and stem. In certain districts along the Columbia and Snake Rivers, there was a most serious outbreak of this pest in 1913. Fortunately the early potato crop was well advanced by the time the insects swarmed into the fields and gardens, but in many cases the late potatoes suffered severely. Where grasshoppers are already in the fields, orchards and gardens, the best method is to kill them with a poisoned bran mash, one formula being: Bran 25 lb., syrup 1 gal., Paris green 2 lb. The Colorado potato beetle was found quite commonly in many parts of Eastern Washington during the summer of 1913, thus being, at last, established in the State. Both Paris green and lead arsenate are effective poisons, the latter being perhaps preferable. Another introduction of recent years is the potato tuber moth, or potato worm, which, for several years, has been the worst potato pest in California. With this, as indeed with most other pests, clean culture is a most important method of control.

Giroday (B. de la). **L'Artichaut dans la Gironde.** [The Artichoke in the Gironde.]—*La Vie Agric. Rur., Paris*, iii, no. 12, 21st Feb. 1914, pp. 331-335.

In this article the author gives an account of the intensive production of the artichoke in Gironde, describing the varieties grown and methods of cultivation. In a paragraph on the natural enemies of this crop, the author notes that the larvae of a *Vanessa* butterfly [doubtless *Pyrameis cardui*] invade the fields of artichokes in great numbers and entirely devour the leaves and fruit. Tobacco decoctions are of value in protecting the young plants, but cannot be used for older plants, since they impart to the fruit the odour of tobacco, rendering them useless for food. This pest disappears in a few weeks and several years may pass without any further attacks. The green Cassid beetle, though it does not cause such serious damage as the butterfly, renews its attack every year. The larvae are very resistant to insecticides and the adults eat the leaves of the plants and greatly reduce their value. Since the eggs are laid early, it is possible to treat with nicotin before the plants have developed much. The ravages of this pest are checked by the rains, whilst very warm dry periods are favourable to it.

Graf (J. E.). **A Preliminary Report on the Sugar-Beet Wireworm.** *Bur. Entom. U.S. Dept. Agric., Washington, D.C., Bull.*, no. 123, 28th Feb. 1914, 68 pp., 23 pls., 9 figs.

The sugar-beet wireworm, (*Limonius californicus*, Mannh.), has been a more or less destructive pest on sugar-beets since they were first grown in California, and prior to that time was known as an alfalfa and maize pest. It may be considered the worst insect enemy of the sugar-beet, because it is constant, appearing every year to a greater or less extent, and its injury occurs in such a manner that replanting is generally impractiable. The beet is killed, since the wireworm cuts into and injures the root. This insect is most injurious while the beets are young and is destructive only in the larval stage. Other beetles occur with the sugar-beet wireworm, e.g., *Drasterius livens*, Lec., *Cardiophorus aeneus*, Horn, and *C. crinitus* (?); *Platynus* sp. has been commonly noted and also *Blapstinus* sp. and a species of *Coniontis*. Among the food-plants recorded, the larvae have been noted on wild beet, potato, Lima bean (all varieties), maize (all varieties), Johnson grass (*Sorghum halepense*), dock (*Rumex hymenosepalus*), alfalfa (*Medicago* spp.),pigweed (*Amaranthus retroflexus*), nettle, wild aster and Mustard (*Brassica niger*). Oviposition takes place during the spring, mostly in April; a loose damp soil is selected and nearly all the eggs are placed in the top inch and a half of soil. A small mite *Parasitus* (*Gamasus*) *coleoptratorum*, L., was commonly observed with the eggs. Each female may deposit about 100 eggs, and these hatch in about 15 to 25 days. The exact length of the larval stage is not known, but from experiments it seems that it could not be less than three years. After emerging from hibernation the wireworms feed on the old beets until they can obtain young beets. The pupal stage lasts for about a month. Old beet-roots are the favourite food, and the larvae are only occasionally found at the roots of alfalfa, Johnson-grass, wild beets and young beets. In the experiments recorded, none of the beetles were very active after 15 days, and after 25 days they became very feeble. Under field conditions 75° F. to 80° F. seems to be the optimum temperature for their various activities, and most adults show remarkable ability to withstand physical injuries or sudden and unfavourable climatic conditions, such as great changes in temperature and several severe rainstorms in succession. They pass the severest part of the winter in the soil and the time of their appearance in the spring is influenced to a large extent by artificial agencies such as spring ploughing. Thus prematurely driven to the surface, they seek "secondary hibernation" under almost any shelter. On becoming active they remain relatively near the hibernating quarters, but are disseminated by the occurrence of strong winds and floods.

The wireworms have several important natural checks. Nearly all insectivorous birds eat them, and the Carabids or ground-beetles, dispose of large numbers. The adults are also at times severely attacked by a fungous disease. No efficient parasite has yet been found for this pest, though a bacterial disease is often present. On the whole, the larvae of *L. californicus* are very little affected by their animal enemies, or by fungous or bacterial diseases.

Experiments were made to test remedies for the sugar-beet wireworms. Those depending upon the use of poisoned bait were far from

satisfactory—the wireworms showing little ill effect from eating the bait. The poisons used were lead chromate, potassium cyanide, strychnine, Paris green, lead arsenate and zinc arsenite A fairly exhaustive series of experiments was carried on, using 19 repellent substances against the larvae. None however gave results which would justify recommending them as a deterrent. In one case the land was dressed with a solution of potassium cyanide. By this method the cyanide is used sparingly and its killing power was very good, but it remains to be seen whether a suitable strength of cyanide can be found which will kill the wireworms, without harming the beets. The destruction of the pupae by cultivation has been recommended, but in order to be effective, the autumn ploughing would have to be quite deep (9 to 10 inches). Experiments with guano fertilizer show that it would be impracticable for ordinary use. No doubt much of the injury to the beets may be avoided by early planting, as this gives the roots a good start before the wireworms are doing their most extensive feeding. Clean culture against the adults, by compelling them to seek shelter elsewhere and exposing them to the attacks of their bird enemies, seems to be the most practical remedy found thus far for this insect. Old beet tops are left to act as a fertilizer and are supposed to be ploughed under, but by the time the land has been harrowed several times many appear on the surface again. All old tops should be cleared away, and the efficiency of this remedy would be increased if autumn ploughing and early planting were combined with it.

BAGRINOVSKY (—). **О борьбѣ съ вредными насѣкомыми въ Куликовскомъ лѣсничествѣ Тамбовской губерніи за 1913 годъ.** [The fight against injurious insects in the Kulikov Forest of the Government of Tambov in 1913.] — **«Лѣсная жизнь и Хозяйство.»** [*Forestry life and Economy*], *Tambov*, no. 6, March 1914, pp. 6-10.

*Melolontha* adults were not abundant in 1913, and owing to spring frosts, very few emerged until the middle of May. The collection of beetles organised in the Forests which lasted till the 20th May, produced over half a ton of beetles, which, it is calculated, contained 335,296 females. A table showing the amount of beetles collected daily is given. The premium paid for the collections was at first about 1½*d.* per lb., but owing to the small number of beetles, it was found necessary to increase this figure to about 1¾*d.* The total cost of collection, in which some 130 people, mostly women, were employed, was £8 16*s.* The work was done principally between 10–11 a.m. although some women collected the whole day; the area over which the collections were conducted was not more than 6,750–8,100 acres. Other purposes necessitated an expense of £3 12*s.*, so that the total cost of the campaign was £12 8*s.* Judging by digging operations, undertaken to ascertain the prospects of the numbers of adults in 1914,even less than in 1913 may be expected, as nearly all the larvae found were of the first and second year, only occasional specimens of three-year old larvae being observed.

An experiment has been started to ascertain the amount of damage done by the larvae to trees of various ages, and the ability of the trees to withstand the damage; four pines and one oak were surrounded in autumn with a trench and about 1000 larvae were brought into the enclosure and left there.

A flight experiment was also undertaken by Prof. I. K. Tarnani; about 1,000 beetles were marked with anilin blue and black varnish and released in a field 2–2½ miles away from the forest; but no marked beetles were found amongst those collected. The experiment was repeated by V. P. Shugaiev with inconclusive results.

The collected beetles were dried either in a seed drying room, where they perished rapidly from the high temperature, or in a special oven, and they were afterwards ground to powder in a special mill. Samples of this powder were sent to Professor Tarnani of Novo-Alexandria for analysis, in order to ascertain whether it can be used as manure.

Trenching of the ground was undertaken to ascertain the results of the collection of the adults upon the numbers of the larvae in the soil; the good results of these operations will appear in the report of Professor Tarnani. During the work, some diseased larvae were found and sent to the Phytopathological Bureau of St. Petersburg, and in one case, the infection of the larva with *Botrytis bassiana*, Bos., was established.

RUTHERFORD (A.). **Some Notes on *Xyleborus fornicatus*, Eichh., (Shot-Hole Borer).**—*Trop. Agric., Peradeniya*, xlii, no. 2, Feb. 1914, pp. 220-222.

In this paper the author records several experiments he has made with a view to determining whether, in burying prunings as a control against *Xyleborus fornicatus*, Eichh., the beetles are killed or are unable to reach the surface of the soil. Infested twigs were first kept under observation, and from these it was found that the proportion of males to females is one to five and in a larger count, 1 to 12·25. In each gallery in the twig the number of immature insects is from 6 to 10 in a vigorous colony, or may be as high as 17 or 18. Experiments were next made regarding the method of control. In the first place several beetles were placed in a glass jar and covered with earth to a depth of nine inches; this was found to present no formidable barrier to their emergence. In other experiments infested twigs of tea were placed in two cylinders and covered with 7 and 5½ inches of soil respectively. After 30 days, the contents were examined, the twigs showed a growth of white fungus and below the bark, the wood was almost black. Beetles were still present and thriving, though some had been observed on the surface of the soil and probably some had escaped through holes eaten in the muslin cover. On 30th October twigs were buried in a similar manner with slaked lime. No beetles had been seen by 8th November, but when the twigs were examined, living beetles and larvae were found. Some of the twigs were left in the cylinders, and it was found that slaked lime had failed to kill the larvae after an exposure to it of 23 days. Quicklime was next used, but, as with the slaked lime, the beetles, under laboratory conditions, continued to breed in prunings that were far gone in decay, provided these are not too dry, and were able to work up through as much as 7½ inches of

fine earth mixed with the lime. It was also found that in prunings left on the surface of the ground for as many as 13 days, adults and even pupae may remain alive. Dipterous puparia and larvae are not infrequently found in the tunnels of *X. fornicatus*, but even if they prey on the shot-hole borers, the extent to which they do so is practically negligible; beetles and their larvae and their eggs have been found in many galleries that contained maggots. It is clear that the maggot is an unwelcome tenant of the gallery, but it may merely eat the fungus which forms the food of the beetle and thus serve to diminish the number of beetles reaching maturity. Other insects have been encountered on rare occasions in the tunnels. In the light of present knowledge, the means of control recommended are, the burning of prunings, discovery and elimination of breeding grounds in plants other than tea, cultivation and manuring, and prevention of the infestation of fresh areas. *X. fornicatus* is now known to occur in many localities in Ceylon, a list of which is given.

RUTHERFORD (A.). **Tea and Citrus Mites.**—*Trop., Agric. Peradeniya,* xlii, no. 3, March 1914, pp. 225-229.

The author in this paper records the occurrence in various localities of the following mites, *Brevipalpus obovatus*, Donn, *Tetranychus bioculatus*, Wood Mason, and *T. mytilaspidis*, Riley, and gives a description of them. *B. obovatus* is a common and widely distributed pest of tea. The mite lives in colonies on the under surface of the leaf, and Green has recorded cases in which whole bushes have been almost denuded of leaves and even killed as a result of the work of this pest. Under the name of *Tenuipalpus californicus*, Banks describes a mite bearing a striking resemblance to *B. obovatus* which occurred in California. The author has also observed *B. obovatus* on citrus trees. *T. bioculatus* attacks chiefly the upper surface of the leaves, but does not prove so injurious in Ceylon as the other mites of tea. Green records this mite from Camphor and Grevillea, and the author has seen it on *Eugenia jambos*. The author has recently found on Citrus in Ceylon, the Citrus Red Spider (*T. mytilaspidis*, Riley) of California. It was first described from orange in Florida in 1885, and is capable of doing considerable injury.

HEWITT (C. G.). **The Protection of Birds in and around Ottawa.**—*Ottawa Naturalist, Ottawa.* xxvii, no. 12, March 1914, pp. 161-171, 2 figs.

After drawing attention to the enormous amount of damage done to crops, etc., by insects, the author gives some account of way in which birds may be used as a controlling factor and adduces figures to show that the work they may do, in destroying insects, is very considerable. Insects constitute 65 per cent. of the total yearly food of woodpeckers, 96 per cent. of that of fly-catchers, and 95 per cent. of that of wrens. Upwards of 5,000 insects have been found in the stomach of a single bird. The value of the birds is increased by the fact that, at the time when insects are most abundant, birds are most active and require more food, especially animal food, to feed their young; a pair of tits and their young will consume about 170 pounds of insects during a year.

The American robin (*Planesticus migratorius*) probably appears earliest in the year; its food consists largely of cutworms. The blue bird (*Sialia sialis*) is not so common in the Ottawa district; insects, such as grasshoppers, beetles, and caterpillars, constitute about 68 per cent. of its food. Wrens, such as the house wren (*Troglodytes aedon*), chicadees (*Penthestes atricapillus* and others), martins (*Progne subis* and others), the tree swallow (*Iridoproche bicolor*), two of the woodpeckers (*Colaptes auratus* and *Dryobates pubescens*), etc., are readily attracted by nesting boxes, of which various forms are described. Such boxes are not costly, and experience has shown that they help to solve the problem of destroying various pests.

Greene (C. T.). **The Cambium Miner in River Birch.**—*Jl. Agric. Research, Washington*, i, no. 6, March 1914, pp. 471-474, 2 pl.

The fly *Agromyza pruinosa* belongs to a family of leaf and stem miners, but is remarkable in that it mines in the cambium; the mine leaves a scar known as the "pith-ray fleck," and on birch trees in Europe it is the work of *A. carbonaria*. *A. pruinosa* has been reared from birch trees in America, and similar, if not identical, species have been found on red maple (*Acer rubrum*) and wild cherry. The trees attacked are outwardly healthy, and the damage can only be seen on exposing the cambium, which shows the galleries made by the insect. Larvae, kept in jars containing earth and sand, emerged as adults at the end of April and the beginning of May. The larvae emerge from the roots and pupate in the earth. A hymenopterous parasite of the miner has been reared; this parasite, *Sympha agromyzae*, lays its egg in the egg of the host; no sign that the host is parasitised is recognisable until after pupation, when the parasite emerges from the pupal case of the dipteron.

Knab (F.). **On the Genus** *Cryptochaetum*.—*Insec. Inscit. Menstruus, Washington*, ii, no. 3, March 1914, pp. 33-36

The author revises the Cecidomyid genus *Cryptochoetum*, which is important in that it contains species which are parasitic on scale-insects and have been used in America for their control. The species referred to and described are *Cryptochoetum iceryae*, Williston, and *C. monophlebi*, Skuse, both formerly placed in the genus *Lestophonus* and parasitic on *Icerya purchasi*, and *C. curtipenne*, sp. n., bred from the scale-insect *Walkeriana* (?) *kandyense* in Ceylon.

Crawford (J. C.). **Three New Hymenoptera** (*Chalcidoidea*).—*Insec. Inscit. Menstruus, Washington*, ii, no. 3, March 1914, pp. 36-38.

Three new species of Chalcid parasites are described: *Pachyneuron hammari*, bred from codling moth at Rosewell, New Mexico; *Cyrtogaster glasgowi*, reared from puparia of *Brachydeutera argentata* at Urbana, Illinois; and *Pleurotropis testaceipes*, from a leaf-miner on an undetermined plant at Batesburg, S. Carolina.

Hood (D.). **Two Porto Rican Thysanoptera from Sugar Cane.**—*Insec. Inscit. Menstruus, Washington*, ii, no. 3, March 1914, pp. 38-41, 1 fig.

Two species of thrips, *Heliothrips femoralis*, Reuter, and *Haplothrips* (?) *tibialis*, sp. n., are recorded as occurring on sugar-cane in Porto Rico; they are both additions to the list of insects known to affect that plant, as well as to the known Thysanopterous fauna of the island.

Cockerell (T. O. A.). **A New Coccid from Arizona.**—*Entom. News, Philadelphia*, xxv, no. 3, March 1914, p. 110.

A new species of Coccid is described under the name *Palaeoccoeus morrilli.* It was taken on a plant resembling, though not identical with, *Viborquia spinosa.*

**Forest Insect Ravages stopped.**—*Ind. Forester, Allahabad*, xl, no. 3, March 1914, pp. 117. [Extract from *American Forestry.*]

By a prompt campaign against a colony of bark beetles (Scolytidae) in the Ochoco National Forest in central Oregon, a danger which threatened to destroy millions of feet of timber was eliminated. To combat this pest the usual method, recommended by the U. S. Bureau of Entomology, is to remove the bark of infested trees between October and July, while the larvae are still in the tree; this is sufficient to kill them and the timber may be sold while it is yet sound. In the Ochoco Forest there was no market, and the forest officers found that the cheapest and most effective method of control was to cut the trees and burn them before the new broods of beetles could emerge. In 1912 the infestation was given a decided check by the cutting of 3,500 trees. In 1913, 40,000 trees were cut, and as a result of these measures the beetles are under control.

**Control Work against Forest Insect Depredations in the Hetch-Hetchy Watershed of the Yosemite National Park.**—*Entom. News, Philadelphia*, xxv, no. 3, Mar. 1914, pp. 132-133.

Investigations have shown that as much as 95 per cent. of the timber, in some of the canyons and valleys of the Tuolumne River, has been killed by bark-boring insects. This condition, affecting the scenic beauty of the north of the Yosemite Valley and its consequent effect on the water supply and general economy of the Hetch Hetchy project, presented an important problem, and arrangements were made to combat the beetles. Two acres were marked off, and on one, measures were taken during July, before the beetles would have begun to emerge from the bark; the second area was treated in September and at the beginning of October, at the time when the beetles coming from the overwintered broods had entered the bark. The measures taken were to fell the infested trees, lop off the limbs, pile them on the trunks and set fire to the whole; this scorched or burned the bark sufficiently to kill the insects. The trees thus treated, 1,671 in all, ranged in diameter from 6 inches to 54 inches, the average being about 22½ inches. The cost was about £240. It is estimated that a further outlay of about £100 will suffice to bring the beetle quite under control. The insect responsible for the death of such a large percentage of lodgepole pine

timber in the northern section of the park is the mountain pine beetle (*Dendroctonus monticolae*). It attacks healthy trees and kills them by mining between the bark and wood so as to stop the movement of sap, which results in the death of the tree within 10–12 months after it is attacked.

JABLONOWSKY (J.). **Recent Work of the Royal Entomological Station of Hungary.**—*Mthly. Bull. Agric. Intell. Plant. Dis., Rome*, v, no. 3, March 1914, pp. 316-320.

In 1913, the most troublesome pest in Hungary was the corn ground beetle (*Zabrus tenebrioides*, Goeze) which injures the cereals in autumn, attacking the seedlings, and if the winter be mild continues its ravages up to the beginning of May. Spraying, with an ordinary knapsack-sprayer, with a nicotin mixture made by dissolving 2 oz. of sulphate of nicotin and 1½ lb. of soft soap in 10 gallons of water, was effective in killing all the beetle larvae. Healthy, as well as attacked, plants should be treated and the earlier the spraying is done, the more effective is its action and the lower the cost. The cereal or barley leaf beetle (*Lema melanopus*) is a sporadic pest of barley and oats, attacking their leaves in the early spring, and causing the plants to dry before the proper time and yield no seed. Catching the insects by means of nets and also destroying the larvae with a spray, were found to be efficient methods of control. Spraying is more satisfactory in dry weather, the formula given being, 4 lb. of nicotin sulphate and 15 lb. of soft soap to 100 gallons of water.

Other experiments were conducted on a larger scale, with sulphate of nicotin, against the caterpillars of *Clysia ambiguella* and *Polychrosis botrana*, which cause as much injury to vines in Hungary as elsewhere. Sprays containing 2 oz. of nicotin (either sulphate or extract) and 1½ lb. of soft soap to 10 gallons of water, or Dr. Jean Dufour's mixture composed of 1½ lb. of pyrethrum powder and 3 lb. of soft soap to 10 gallons of water, were used, and the experiments showed that 98 to 99 per cent. of the larvae were destroyed, provided that the following conditions were observed :—(1) that the control be commenced at the most favourable moment for the hatching of the caterpillars (in Hungary in 1913 it was after May 24th) ; (2) that the spraying be carried out under high pressure ; (3) that the bunches be sprayed on both sides ; (4) that the solutions be composed of insecticidal substances (nicotin and pyrethrum) and of substances capable of removing fat (soap). Experiments were undertaken against the caterpillars of the grape moth (*Oenophthira pilleriana*) ; the best results were obtained by a combination of hand-picking at the time when the young shoots were beginning to be attacked, and a subsequent spraying with Bordeaux mixture to which ½ lb. of lead arsenate had been added to every 10 gallons of mixture ; what the ultimate result of this method will be as regards efficiency is uncertain.

Cockchafers (*Polyphylla fullo*) have caused much damage in vineyards ; hand-picking of the larvae was the method of control practised ; the insect has a preference for the Scots Pine (*Pinus sylvestris*), Corsican pine (*P. laricio*), Austrian pine (*P. austriaca*) and black spruce (*Picea nigra*), and these were introduced into the vineyards ; the insects are attracted by them, and are more easily collected from them, than from most other trees.

Work was done on the use of lime-sulphur mixture. In spite of the fact that it is very effective against *Lecanium*, its adoption in Hungary is not likely to be very rapid, because (1) its preparation is lengthy; (2) it does not always succeed, on account of the varying nature of the different quicklimes of the country; (3) its preparation is not carried out on a large scale in Hungary, nor at a low price; and (4) the practice of spraying fruit trees with carbolineum (15 lb. of carbolineum to 10 gallons of water) is constantly gaining ground.

Picard (F.). **A propos de l'action du froid sur les insectes.** [The action of cold on insects.]—*Progrès Agric. et Vitic., Montpellier*, xxxi, no. 11, 15th March 1914, pp. 332-333.

Insects may be divided into two classes, according to the manner in which they pass the winter. Some are in a latent state, either as eggs, larvae or pupae, while others lead an active existence and feed as they do in summer. This is the case with a fly, *Agromyza abiens*, found in artichoke and cardoon gardens in the South of France and which the author has been studying for some time. Its larvae are very voracious and cause much damage, but about the middle of January last, when the temperature fell to 6°F., they practically all perished, and examination led to the conclusion that their death was due to cold. This species does not hibernate, and is therefore unable to resist rigorous temperatures.

The author remarks that "woolly bears" (the larvae of *Arctia caja*) will be less abundant this year than last, because nearly all were destroyed last season by *Empusa aulicae*. On the other hand, it is very doubtful whether the fungus *Beauveria globulifera*, which requires a mild and damp winter, will have been able to kill many of the vine flea-beetles (*Haltica ampelophaga*). A severe winter will therefore have been harmful in this sense.

Girault (A. A.). **Hosts of Insect Egg-Parasites in Europe, Asia, Africa and Australasia, with a supplementary American List.**—*Zeitschr. wissen. Insektenbiol., Berlin*, x, no. 3, 15th March 1914, pp. 87-91.

A list is to be given, of which the present paper is the first part, of the insect hosts of egg-parasites as yet recorded from the areas indicated, and the American list drawn up by the author (1907, 1911) is supplemented. The present part includes nearly 80 species.

Zacher (F.). **Papilios als Schädlinge der Agrumen.** [Papilios as citrus pests.]—*Entom. Zeitschr., Frankfurt a. M.*, xxvii, nos. 50-51, 14th & 21st March 1914, pp. 288-289, 295-296, 5 figs.

Few Papilios are of economic importance, but the caterpillars of these show a preference for the hard, shiny leaves of citrus trees throughout the world. The African *Papilio demodocus*, Esp., lays single eggs on the underside of a leaf. Many eggs are laid on unsuitable plants, or even on dry wood, but always in the immediate vicinity of orange trees, so that the strong smell emanating from the latter is supposed by Vosseler to provoke oviposition. This species increases rapidly and does not appear to suffer from enemies and

parasites. Riley states that the North American *P. cresphontes*, which has the same habits, is avoided by nearly all birds. In India and Arabia, *P. demoleus*, L., is found in place of *P. demodocus*, Esp. In China and Japan the citrus-injuring Papilios are represented by *P. xuthus*, L., and *P. demetrius*, Cram., and in Australia by *P. aegus*. In the Malay Archipelago *P. memnon*, L., is the species which attacks citrus plants. *P. polytes*, L. (=*pammon*, L.), which is smaller than *P. memnon*, is found in British India and the Sunda Islands. In Florida and Cuba, orange and other citrus-trees are attacked by the caterpillars of *P. andraemon*, Hb., and *P. thoas*, L. The injury done to citrus plants by Papilio caterpillars may amount to complete defoliation, with resultant loss of the crop. The collection by hand of caterpillars and pupae is advisable, but if the trees be too big or the plantation too extended, spraying may, exceptionally, become necessary. A solution of ½ lb. lead arsenate in 50 gals. water should be used, and care must be taken to stir the spray solution to prevent the poison from settling.

Vassiliew (I. V.). **Вредители хлопчатника въ Ферганѣ по наблюденіямъ 1913 года.** [Pests of cotton in Fergana, according to observations made in 1913.]—**Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. 3. и 3.**—[*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Adminstration and Agriculture,*] *St. Petersburg*, x, no. 10, 1914, 23 pp., 13 figs.

The pests of cotton in Russian Central Asia and in Transcaspia are still little known, notwithstanding the fact that the cultivation of cotton in Turkestan is increasing from year to year. The author was sent by the Bureau of Entomology of the Central Board of Land Administration and Agriculture to study these pests and here gives the results of his observations in 1913 in Fergana, which province is the principal cotton-growing district of Russian Turkestan. The following pests were observed: *Thrips flavus*, Schr., is injurious to cotton both in the adult and larval stages and was found as early as the middle of April, when the insects attack the first pair of leaves, causing smooth, shining, light spots of irregular form; such injuries are not as a rule fatal. When the first true leaves appear, the insects attack them, chiefly at their base or near the main veins. This may cause the leaves to fall off, but, in some cases, the damage leads only to deformation. The insects then move to the more developed leaves, and several individuals may be found at the base of each leaf, mostly at the point where the main veins separate; the tissue of the leaves on these spots turns brown and withers. With good cultivation the effects of the damage are less noticeable. *T. flavus* is widespread in Fergana, and in the middle of June, the proportion of injured plants on the fields of the Agricultural Station in the Starvation Desert was 40–50 per cent. Sometimes these insects occupy leaves on which are colonies of *Tetranychus telarius*, and these mites are evidently destroyed by the *Thrips*, which establish themselves underneath the webs formed by the mites. *T. flavus* was also found by the author on *Atriplex* and on plums. A solution of green soap was used as an insecticide against the *Thrips*, about ½ lb. of soap being dissolved in about 2·7 gallons of

water. After the first spraying 40 per cent. of the insects perished; the second spraying raised this figure to 80 per cent.; the young plants, which at the time of spraying (25th–26th June) had two or four true leaves, did not suffer from the insecticide.

*Euxoa* (*Agrotis*) *segetum*, Schiff., appeared at the same time on the cotton fields of the Station of Adijan. During the daytime the young larvae eat the parts of the plants below the surface of the soil, the larger individuals dragging other plants into their holes; at night they gnaw the cotyledons of the seedlings. These larvae also feed on certain weeds common on cotton plantations in Fergana, such as *Convolvulus, Malva rotundifolia* and *Plantago*; they also attack maize. These larvae did considerable damage at Pachtalykulsk, to a new variety of cotton brought by A. N. Liubtchenko from America and sown for experimental purposes to obtain hybrids. The percentage of damaged crops on some fields was 80–90 per cent.

*Aphis gossypii*, Glov., appeared after the beginning of May. At first only small colonies of winged and wingless specimens were found, but after June, the numbers grew rapidly. The progeny of winged individuals were of a yellowish or brownish-green colour and occupied the lower sides of the leaves; those of wingless parents were blackish-brown and rested mostly on the stalks and buds of the cotton plants. From the beginning of July the migration of the aphids began and then the injuries caused by them became obvious. The injured plants had an unnatural, shining appearance. The author attributes to these insects the dropping off of the buds and young bolls, which is usually ascribed to the influence of dry winds or lack of water. The injuries caused by aphids also favoured the growth of a fungus (*Capnodium*) which develops on their excreta.

At the beginning of July, the author discovered on cotton some predaceous insects which destroyed the lice, such as the larvae of *Syrphus, Leucopis, Chrysopa, Coccinella 7-punctata*, L., *C. 18-punctata*, Scop., *Adonia variegata*, Goeze, and other species; also a Braconid of the genus *Aphidius*, which proved very effective in destroying the pests. About the middle of July some new enemies appeared in the form of larvae of *Aphidoletes* and of *Triphleps albidipennis*, Reut., and a parasite, of the family PTEROMALIDAE, replaced the Braconid. Each female of *Aphidius* in captivity attacked only 3 to 4 aphids and infested only the wingless forms. The adult parasites lived for a week in captivity before ovipositing, being fed on honey. At the beginning of July the same aphids were also found on melons and pumpkins when these plants were situated near cotton fields, also on *Hibiscus trionum*, L., a weed belonging to the same family as cotton. The activity of all the natural enemies effected a marked decrease in the numbers of the lice, and by the middle of August it was difficult to discover specimens near Andijan, although round Skobelev, small colonies existed even in September.

Besides *A. gossypii*, another aphid, which has just been described by Mordwilko and named *Acyrthosyphon gossypii*, Mordw., was found on cotton; it is similar to *Aphis pisi*, being distinguished from it, amongst other characters, by its longer proboscis. The author first discovered small colonies of these aphids, consisting of wingless viviparous females and larvae of various ages, on the 29th June near Andijan; a month later the numbers of this species were much greater

and the colonies contained winged and wingless forms and were found on the lower sides of leaves in company with *A. gossypii,* but there was no sign that they were injuring the plants.

*Tetranychus telarius*, L., was first observed by the author on cotton seedlings on the 25th June, near Skobelev. A month afterwards the presence of this mite was more noticeable owing to the appearance of purple-red spots on the leaves of the cotton. The colonies of *T. elarius* usually appear on the lower sides of the leaves, living beneath a web. The purple spots produced by them are chiefly peculiar to American varieties of cotton, e.g. *Gossypium hirsutum*, while the local sort, *G. herbatium*, does not exhibit them ; this is explained by the presence of a red juice in the leaves of American cotton, the Russian cottons having a practically colourless juice. The local varieties are more liable to the attacks of this pest, loss of leaves occurring more frequently in their case. Occasionally there is an extraordinary growth of the colonies and the whole plant is then covered with the web. Amongst the enemies of *T. telarius* are mentioned :—*Scolothrips sexmaculatus*, Pergande, larvae of *Aphisoletes*, larvae, nymphs and imagos of *Thripleps albidipennis*, Reut., and the larvae and imago of *Scymnus punctillus*, Ws.

As a remedy, the author has tried a solution of wheat paste ; 1 lb. of wheat flour to 8 gallons of water, the flour being first made into paste in the usual way. He described his experiments with this remedy and with flowers of sulphur, and it appears that the former proved much more effective ; it is cheaper, 3 gallons costing only about ½d., and kills the mites in a very short time (1½ to 2 hours), by smothering them ; while the second remedy causes death only after a few days, a certain percentage of the mites escaping.

*Acridium aegyptium*, L.. were discovered at the end of June in the larval stage on cotton leaves. The larvae, as well as the nymphs, feed principally on cotton, while the imago feeds on the foliage of bushes and fruit trees. In captivity the emergence of the insects began on the 7th September, indicating that *A. aegyptium* winters in Fergana as an imago, which is also the case in the Crimea. In Andijan, 10 per cent. of the plants were sometimes injured. The same pests were also noticed in Pachtalykulsk and in the Starvation Desert.

At the end of July, injury to cotton by *Pandemis* (*Tortrix*) *chondrillana*, Hs., was first observed. The larva draws the leaf into a tube and skeletonises it, destroying as many as 3 to 4 leaves during its life ; it also attacks the buds. *P. chondrillana* has two broods during the summer.

In July, damage to the leaves of cotton by *Acronycta rumicis*, L. var. *turonica*, Staud., was observed in Pachtalykulsk. The young larvae eat away the parenchyma of the leaves, not touching the epidermis ; later on they gnaw round holes through the leaves, leaving the main veins untouched. Such injuries were mostly observed on cotton growing near plantations of poplars or willows. Nearly all the larvae collected were infested by *Anilasta* sp.

*Adelphocoris lineolatus*, Goeze, was frequently found on cotton in Andijan, especially where the plantations of cotton joined lucerne fields. This pest sucks the pedicles, stalks and leaves of cotton, causing in some cases the falling off of young bolls and buds. In captivity it was observed to oviposit on stalks of cotton. *Monostira*

*inermis*, Horv., although not living on cotton, but on leaves of willows and poplars, finds its way on to cotton and sucks the leaves, causing small pale spots. This was observed in the Starvation Desert at the beginning of August.

In the middle of July, a peculiar injury to cotton was noticed near Andijan, consisting of numerous light irregular spots, concentrated chiefly near the tips of the leaves. This injury was caused by *Chlorita bipunctata*, which was also found on small-leaved elms. With it occurred *Agallia sinuata*, M. Rey, which usually sucked the stalks and petioles of cotton, without however causing noticeable damage. Both species produce two generations during the summer.

During July and August, the maggots of a fly, *Agromyza flaveloa*, Fall., were observed mining the leaves of cotton near Andijan and Akobelev ; the imago appeared in the middle of August.

Single examples of *Chloridea obsoleta*, F., and *Laphygma exigua*, Hb., were also found by the author on cotton.

Sudeikin (G.). **Озимый червь и борьба съ нимъ.** [*Euxoa segetum* and the fight against it.]—Reprint from **« Ежегодникъ Бобровской Уѣздной Земской Управы.»** [*The Annual Report of the District-Zemstvo of Bobrov,*] *Bobrov* (*Govt. of Voronezh*), 1914, 6 pp., 4 figs.

The author, in a popular form, describes the imago and larvae of *Euxoa segetum*, figuring both stages, and giving some general information as to its life-history and the injuries it does to crops. In the government of Voronezh, there are two generations, at the beginning of summer and in autumn. The larvae of the first generation injure " bachza " plants, beetroots and tobacco, while the second generation damages the seedlings of winter-sown grain. The author suggests as remedies : Trenches round the stripped patches of the fields, which may be made with a plough ; poisoning the larvae by spraying with Paris green or by means of baits consisting of poisoned leaves of cabbage, beet, etc. ; ramming the spots seriously injured, with heavy wooden rollers ; ploughing deep in autumn and early in spring ; collecting and destroying the larvae ; destroying weeds, on which the imagines oviposit and which form the principal food of the young larvae before the grain begins to sprout ; catching the imagines in troughs with molasses.

Rossikov (K. N.). **Занятый паръ, какъ предупредительная мѣра борьбы съ озимымъ червемъ или бабочками озимыми совками.** —[Occupied fallow land as a preventive against *Euxoa* (*Agrotis*) *segetum*, Schiff., and *Feltia* (*Agrotis*) *exclamationis*, L.]. **Труды Бюро по Энтомологiи Ученаго Комитета Глав. Управ. З. и З.** —[*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture*], *St. Petersburg*, x, no. 7, 1914, 15 pp., 1 map.

The author has studied the question of "occupied fallow land" as a means of preventing the multiplication of *E. segetum* and *F. exclamationis*, and this is a report on his investigations conducted during the summer of 1913 on a dessiatine (2·7 acres) of layland, being a portion

of the fallow fields of peasants of a village in the Tzarskoselsky district of the government of St. Petersburg. The plot selected for experiment extended across the middle of the fallow fields, with a boundary strip on each side. The plot was divided into six parallel sections of various sizes, out of which three, the two border sections and one in the middle, were turned into "occupied fallow"; two, on both sides of the "occupied fallow" part of the middle, were kept in a state of "black fallow," i.e. repeatedly harrowed during the summer; while the sixth part was allowed to grow over with weeds, i.e. kept as "peasant fallow" or "green fallow." Some of these sections were divided from each other by boundary strips of over a foot wide, others had no boundaries; the borders of the roads passing on each side of the plot were overgrown with abundance of weeds.

The author records chronologically all the work undertaken on the fields, giving the dates when the sowing, harrowing, etc., was done on the individual sections. Two of the occupied fallow parts were respectively sown in the first half of June with vetches and oats, and with vetches and peas; the third "occupied fallow" was sown with "Ivanovsky rye." At the end of that month the "peasant fallow" was overgrown with *Rhinanthus cristagalli*, *Polygonum convolvulus*, *Cirsium arvense*, *Atriplex patula*, *Sonchus arvensis*, *Pedicularis palustris*, *Euphrasia officinalis*, *Fumaria officinalis* and other weeds.

The emergence of the perfect insects began after the 1st of July and, in order to attract them to the experimental plots, some troughs with molasses were put on the "occupied and peasant fallow." When the number of the imagines was at its maximum (from the 10th to the 23rd July), the troughs were covered with gauze to serve only as attraction for the moths, but not to catch them, as it was not desired to prevent oviposition. During the time that the moths were on the wing, the author and his assistant carefully searched the crops on the "occupied fallow" parts, but no eggs were found even on the weeds; the eggs of some of the pests were found on the vetches on these sections, mostly those of *Barathra* (*Mamestra*) *brassicae*, but none of *E. segetum* or of *F. exclamationis*. Examination of "occupied fallow fields" in some other parts of the district yielded the same negative result. Thus it is undoubtedly established that "occupied fallow fields" sown either with vetches, or with vetches mixed with other crops, prevent the moths from ovipositing and consequently check their multiplication. At the end of July, the vetches were mown and removed from the fields and all search for caterpillars of the pest in the soil in which these plants had grown, proved useless. Many eggs and larvae were found on the section grown over with weeds, the eggs being deposited not on the weeds, but on the straw of the not yet rotted dung; the black fallow parts also exhibited eggs, laid on the earth and on the straw of the dung; larvae were also found in the soil, although their numbers were much less than on the "peasant fallow." Besides searching the soil, larvae were also collected by means of baits with the same result. In August the whole experimental plot, with the exception of the one section sown with "Ivanovsky rye," was reploughed, manured with artificial manure and sown with rye.

Two weeks afterwards, when the seedlings appeared, the state of the various sections was as follows:—the crops on the "occupied

fallow" were quite uninjured, except near the roads and boundary strips; those on the "black fallow" (i.e. sections, which were kept in that state throughout the summer) showed considerably more injury from the larvae; while more than half the crops on the "peasant fallow" section were destroyed, and it is expected that before the arrival of cold weather, these will be totally ruined.

[Black fallow land means layland left unsown but constantly ploughed, in order to prevent the growth of grass and weeds.

Green (or Peasants) fallow land means layland allowed to grow over with weed grasses and used as pasture land in peasant agriculture.

Occupied fallow land means layland sown with some annual plant, which either can be mown as grass (vetches with oats, turnips), or can be reploughed, the plants serving as "green manure" (vetches, buckwheat, white mustard).—Ed.]

Zacher (F.). **Die wichtigsten Krankheiten und Schädlinge der tropischen Kulturpflanzen und ihre Bekämpfung.** [The more important diseases and pests of tropical plants and methods of control.] Part I.—*Deutsche Tropen-Bibliothek, Hamburg*, x, 1914, 152 pages, 58 figs.

This volume is intended to serve as a handbook to those interested in the cultivation of plants and trees in the tropics and is divided into two parts, the first dealing with diseases of cultivated tropical plants in general, and the second with those which attack plants of special economic importance. In the first part parasites, insects and fungi are dealt with, predisposition and immunity to disease discussed, and methods of treatment, insecticides, etc., are given. The second more specialised part treats in detail of plants of special economic importance, namely, cotton, cacao, coffee and tea.

Silvestri (F.). **Viaggio in Africa per cercare parassiti di mosche dei frutti.** [Report on an expedition to Africa in search of parasites of the Fruit Fly.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric. Portici*, viii, 1914, pp. 1-164, 69 figs.

In 1912, at the request of the Board of Agriculture and Forestry of Hawaii, the author undertook an expedition to search for parasites of the Fruit fly, *Ceratitis capitata*, which had been introduced in 1910 into Honolulu and was threatening to become a serious pest. The climatic and other conditions of the Hawaiian Islands were favourable to the development and propagation of the fly and mechanical and chemical means of control had proved useless. It was therefore resolved to organise an expedition to discover its natural enemies and to introduce them into the infected areas. The author started in July 1912 for West Africa. It was resolved firstly to ascertain whether *C. capitata* existed in that country, south of Senegal, and, if so, whether it was attacked by special enemies which might be worth introducing into Hawaii; and secondly, in the event of *C. capitata* not being found, whether other species of the same genus or of the genus *Dacus* were available, the parasites of which might be suitable for experiment. The Canary Islands, Senegal, French Guinea, S. Nigeria, the Gold Coast, Dahomey, the Congo, Angola and South Africa were visited.

Various species of *Ceratitis* and *Dacus* were found, many of which occurred during the author's visit, in such reduced numbers as to make it seem certain that they are effectually controlled by inimical factors. The occurrence, distribution and life-histories of many of the species found are described. Certain Braconid parasites of the genera *Opius*, *Diachasma*, *Hedylus* and *Biosteres*, and Chalcids of the genera *Tetrastichus*, *Dirhinus* and *Spalangia*, and Proctotrupids of the genus *Galesus*, seem to be the most active enemies of *Ceratitis* in West Africa ; bacterial and fungoid diseases were also observed. Some species of hymenopterous parasites attack several different species of *Ceratitis* and *Dacus*; parasites of *C. giffardi* and *C. anonae* were experimentally bred by the author on *C. capitata*, and developed to maturity. Living adults of *Opius perproximus*, *Dirhinus giffardii* and *Galesus silvestrii* from West Africa, *Opius humilis* and *Trichopria capensis* from South Africa, and *Diachasina tyroni* from Australia, were brought to Honolulu and bred there in large numbers and were then distributed to other islands of the group; but it is impossible to make any statements as regards the results of these introductions until the permanent establishment of the species has been proved. If *Opius*, *Diachasma*, *Dirhinus* and *Galesus* become acclimatised, a notable destruction of *Ceratitis capitata* may be hoped for. The details of the breeding and liberation of the different species are shown in tabular form.

The author recommended that if *Diachasma tryoni* does not become established on account of the small number of specimens introduced, a large number should be imported from Australia, the transportation of these parasites to Hawaii being very easy. The introduction of other Braconids of the genera *Diachasma* and *Biosteres*, parasites of *Anastrepha*, from Mexico and Central America is advised before any new attempts are made to introduce BRACONIDAE from Africa, because the distance of the latter from the Hawaiian Islands and the habits of the parasites make it difficult to transport them in good condition. A comprehensive bibliography is given.

VERESTCHAGIN (B.) **Кровяная тля въ Измаильскомъ уѣздѣ.** [*Schizoneura lanigera*, *Hausm.*, in the district of Izmail (Govt. of Bessarabia).]—**«Садъ и Огородъ»** [*Orchard and Market-Garden*], *Moscow*, Feb. 1914, pp. 74-76.

The author refers to the history of the spread of this pest and describes its habits and the damage done by it. It appeared some 6 or 7 years ago, in the district of Izmail, in the Government of Bessarabia, whence it spread to some neighbouring districts, and has greatly multiplied during the last 2 or 3 years. In some parts it is impossible to find an apple tree which is free from it, though it has not been found on any other trees. The remedies applied by the peasant horticulturists consist in digging out the attacked trees, crushing the aphids ; smearing the trees with milk of lime, some of them smearing also the more infested spots with some oily substance. The author recommends that the pest should be more energetically attacked in the future, and suggests, in addition to the foregoing remedies, spraying the soil, after the attacked trees have been removed, with ($K_2CS_3$) or with kerosene, cutting away and destroying the diseased branches and spraying the leafless trees with kerosene emulsion.

KOSTROVSKY (Karl). **Сливяная плодожорка, ея жизнь и мѣры борьбы съ нею.** [*Cydia* (*Grapholita*) *funebrana*, Fr., its bionomics and methods of fighting it.]—**«Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*,] *Tashkent*, Feb. 1914, pp.133-138.

In Turkestan, *C. funebrana* is as serious a pest of plums, as *Cydia* (*Carpocapsa*) *pomonella* is of apple trees, but the non-recognition of the *Cydia* pest by fruit-growers and the considerably smaller importance of plum-growing, have resulted in a total absence of any organised campaign against it. In cases when this moth has played havoc with the yield of plums, the owners usually leave the fruit on the trees, thus creating favourable conditions for the further multiplication of the insects. The author describes the imago and egg of *C. funebrana* and gives some information as to its life-history. The moths appear during April and May, flying mostly in the evenings (before sunset) round plum trees and ovipositing on the surface of the plums, one egg (rarely two) being laid on each fruit. The eggs hatch 5 to 6 days after oviposition, and the young larvae usually penetrate into the fruit from beneath, less frequently at the sides, and never on the top. Before gnawing through the skin, the larva makes a web over some part of the surface and in 30 to 40 minutes after emergence from the egg, it disappears into the fruit. The larvae remain inside the fruit not more than 30 days ; pupation takes place on the surface of the earth and the pupal stage lasts about 10-12 days, after which a second brood of moths appears and oviposits on the fruit as before. The first generation injures the fruit mostly during the end of May and throughout June, while the second generation does so in July and August. The larvae of this generation pass the winter in their cocoons and pupate in the following spring. The author points out that the fruit damaged by the first generation shrivels and falls, while that damaged by the second generation does not shrivel, but ripens prematurely. *C. funebrana* attacks also sloes, peaches, and sometimes cherries. The variety of plums known as "kok-sultan" is less injured than others. Among remedies, the author mentions the digging of the earth underneath the trees in autumn or spring and the removal of all wormy fruits. He points out that it is more laborious to fight the insect when it has already begun to be active and when all stages of it would be present, the best time for attack being autumn or spring when the pest is in its pupal stage in the earth. Thus the digging is the more important remedy. The removal of the wormy fruits, which is recommended in case the first remedy has not been applied, must be repeated twice or even thrice during the season. The collected fruits must be immediately buried, as otherwise the caterpillars may emerge and pupate safely. The first generation is usually less numerous and causes less injury.

KOROLKOV (D. M.). **Вредныя для сада насѣкомыя и мѣры борьбы съ ними.** [Insects injurious to Orchards and methods of fighting them.]—**«Садъ и Огородъ»** [*Orchard and Market-Garden*], *Moscow*, Feb. 1914, pp. 69-74.

The author's object is to acquaint fruit-growers with the necessary preventive remedies which must be applied in spring against various pests of orchards. He deals first with *Anthonomus pomorum*, L.,

giving a popular description of the pest, its life-history and the damage done by it. As remedies, which must be applied in spring, he suggests the cleansing of the trees from the loose bark, especially near the ground, where the weevils winter, and the destruction of the rubbish scraped off the trees, as well as of fallen leaves, etc. When the imagines appear in April, it is advisable to shake them from the trees on to sheets and burn them; a detailed description of the preparation of these sheets is given. [See also this *Review*, Ser. A.i, p. 235.] Spraying the trees with milk of lime is also suggested.

*Psylla mali*, Schmbg., and *Aporia crataegi*, L. are also dealt with. Against the former the author recommends spraying early in spring, on frostless days, with sulphate of iron, in order to destroy the eggs, and later, when the larvae have appeared, with tobacco extract or green soap, giving recipes for the preparation of these insecticides. As to *Aporia crataegi*, the destruction of the winter nests is recommended.

GERTOPAN (A.). **О возможности появленія совки на яровыхъ хлѣбахъ посѣва 1914 г. въ Екатеринославской губ.** [On the possibility of an outbreak of *Tapinostola* (*Oria*) *musculosa*, Hb., on the summer-sown crops of 1914 in the Govt. of Ekaterinoslav.]—**«Южное Хозяйство»** [*Southern Husbandry*], *Ekaterinoslav*, Feb. 1914, pp. 123-129.

*Tapinostola musculosa* last year destroyed summer-sown, as well as winter-sown, crops in several districts of the government of Ekaterinoslav; in May of that year, thousands of dessiatines (2·7 acres) of crops were completely lost. Many agriculturists have applied no remedies to prevent the reappearance of the pests this year, such as burning down the remains of the crops or the stubbles, and reploughing the fields immediately. It is therefore likely that a fresh outbreak will occur this year and the author suggests abandoning altogether the sowing of summer-sown crops (barley, wheat and oats) on fields damaged last year by this moth and sowing instead crops which are not attacked by it, such as peas, Turkish beans (fassol), lentils, vetches, maize, sorghum, potatoes, beetroots, bachza plants, sunflower and mustard. Rape and ravison cannot be recommended as they are attacked by many other pests.

GOUGH (L. H.) & STOREY (G.). **Methods for the Destruction of the Pink Boll Worm in Cotton Seed. Appendix.**—*Agric. Jl. of Egypt, Cairo*, iii (1913), no. 2, 1914, pp. 93-95, 1 fig.

The following information is embodied in an appendix to a paper abstracted on pp. 218–219 of the current volume of this *Review* and deals with a method consisting of placing cotton seed on a metal tray, to which electrical sparks were passed from a metal brush held about 6 inches above it. Eight experiments were made, the results of five being tabulated. In no case was there any abnormal mortality amongst the caterpillars and germination was unaltered or only slightly reduced, except with an almost sparkless discharge which appeared to have had a slightly beneficial effect on the seed. A spark-gap of about 4½ inches only, was used throughout, but the results did not

justify hopes that an extra 1½ inch in the spark-gap would be more satisfactory. The three remaining experiments were as follows: (1) A few larvae were picked out and subjected to a shower of sparks about 4 inches in length; (2) a number of "double" seeds were treated in the same way; (3) a sheet of white paper was laid on the metal plate and the positions of 20 seeds marked on it as carefully as possible; a shower of sparks was then passed between the brush and the plate. The results of these three experiments support those of the former five. Every larva that was struck by a spark in Experiment No. 1 was killed by it, the spark piercing its skin and causing bleeding; but on the other hand, not a single larva killed by a spark could be found in the seeds from Experiment No. 2. A diagram showing the position of the seeds and of the holes pierced by sparks in Experiment No. 3 is given and demonstrates that only in one instance, that of a "double" seed, had a spark traversed any of the spaces marked out as being covered by the seeds. This shows fairly conclusively that it is quite impossible to "make sure that a spark passes through each seed," as was suggested, without an excessive waste of time and electric current.

Storey (G.). **Seasonal variation in the Common Boll Worm** (*Earias insulana, Boisd.*)—*Agric. Jl. of Egypt, Cairo*, iii (1913), no. 2, 1914, pp. 99–102, 1 pl., 1 chart.

The variability of the adult boll worm is shown by the fact that it has been described as no less than nine distinct species, as follows: *insulana*, Boisd.; *smaragdinana*, Z.; *siliquana*, H.-S.; *frondosana*, Walk.; *xanthophila*, Walk.; *simillima*, Walk.; *chlorion*, Rmb.; *gossypii*, Frauenf.; *tristigosa*, Butl. Sixteen specimens which illustrate the natural variation of the species are depicted in a coloured plate, two being close approximations to the type form *insulana*. In addition to these, three other forms which occur in Egypt have received varietal names: ab. *anthophilana*, Snell., ab. *ochreimargo*, Warren, and ab. *semifascia*, Warren. These names may be used in a loose sense for the sake of convenience. Dr. Gough's observations led him to believe that the variation was very largely due to climatic and seasonal conditions and at his suggestion the author arranged the very long series of moths in the Ministry's collection according to the dates on which they emerged from the pupa or were captured. The seasonal nature of the variation at once became apparent. The pure green type is the normal summer form; while during the winter, the predominant form is ab. *anthophilana*, which is of a uniform yellowish tint—sometimes orange—except for some narrow dark lines across the wing.

Gough (L. H.). **Entomological Notes.**—*Agric. Jl. of Egypt, Cairo*, iii (1913), no. 2, 1914, pp. 103-106, 1 pl.

A parasite of the Pink Boll Worm, *Pimpla roborator*, Fabr., is fairly common near Cairo, and, accepting the theory that *Gelechia gossypiella*, Saund., is a recent introduction into Egypt, it must be supposed that this *Pimpla* has recently taken to preying on *Gelechia* larvae. The larvae are known to feed externally on a great variety

of other insect larvae. They superficially resemble fly-maggots and are found in seeds hollowed out by the Pink Boll Worms. The adult insects are very common just after the cotton picking in the sheds where unginned cotton is stored, and may be found flying over the cotton and crawling amongst the lint. Nearly all through the year they may be taken flying over the large thistles common on the margins of the desert near Me'adi, and do not appear very particular in their choice of a victim, provided it is a boring insect. It is possible that more than one host larva is destroyed and although not yet definitely observed feeding on *Earias* larvae (Common Boll Worms) they probably do so.

*A New Cotton Insect.* *Cryptoblabes gnidiella*, Mill., a small Pyralid moth, has been bred from cotton bolls collected at Belqâs and Desûq in November 1912 and at Damanhûr in December 1913. This very widely distributed species also occurs in Europe, and seems to be a general feeder. It has also been reared from pomegranates from Gizâ in July 1912. As yet it has caused no appreciable damage to the cotton crop.

*The Kharga Oasis Date Worm.* The quality of the dates yielded by the 400,000 palms in the Kharga Oasis is infinitely inferior to the fruit exported from the neighbouring Oasis of Dakhla. This is due to a great extent to the ravages of the larva of a Pyralid moth, *Ephestia cautella*, Walk., which feeds on the dates when half-ripe. The inhabitants of the Oasis are said to pick their dates half-ripe and roast them in order to kill the larvae. The larvae leave the dates to pupate, spinning a very loose cocoon, consisting only of a few threads. The author found them in 1912 pupating in the date store of the Western Oasis Company, behind loose plaster and in cracks of the wall. This species is often parasitised by *Rhogas kitcheneri*, Dudgeon and Gough, and also occurs in the Delta, where, however, it does not appear to do much damage. It has been found feeding on pomegranates and has been bred from pears imported from Beyrût.

*The Pomegranate Butterfly.* Although the pomegranate butterfly, *Virachola* (*Deudorix*) *livia*, Klug, is well known to cultivators of pomegranates from the damage its larvae does to their fruit, the mature insect does not appear to be often observed by them. The eggs are laid on the fruit soon after they have set; the young larvae penetrate into the pomegranates and feed there. A "sooty mould" often follows these ravages. The larvae leave the fruit to pupate. The butterflies are on the wing in April-May, July-August, and in December-January. In Egypt the caterpillars feed on pomegranates, dates, and sunt pods (*Acacia arabica*), and at Aden on pods of *Acacia edgworthi*. The best method of preventing damage is by "bagging" the fruit as soon as it sets, *i.e.* in March or April. Transparent paper, coarse muslin, or palm-leaf bags do very well for the purpose. In addition, all damaged fruit should be collected and buried at least two feet deep.

DUDGEON (G. C.) & GOUGH (L. H.). **Description of two Braconids parasitic on** ***Earias***.—*Agric. Jl. of Egypt, Cairo*, iii, (1913), no. 2, 1914, pp. 108-110, 2 pls.

The two new species described are *Rhogas kitcheneri* and *R. lefroyi*. *R. kitcheneri* is parasitic on the Egyptian boll worm as well as on

the date worm and is widely distributed in Egypt. There is no doubt that it might be as effective in the control of Egyptian insects as *R. lefroyi* has proved to be in India, and, of course, requires no acclimatisation. This insect deposits its eggs in the larvae of the host, whence its larvae emerge, pupating outside in small, ovoid, silken cocoons, generally found associated with the dead larva of the host. *Rhogas lefroyi* has been frequently mentioned in reports on *Earias*, both in India and Egypt, but has never been described. Specimens introduced into Egypt were not successfully established and the discovery of *R. kitcheneri* now renders its acclimatisation unnecessary.

MELANDER (A. L.). **Winter Sprays: Sulphur-lime Wash and Crude Oil Emulsions.**—*Washington Agric. Expt. Sta., Pullman, Popular Bull. no.* 64, Feb. 1914, 8 pp.

What is known as the 1 : ½ : ½ formula for sulphur-lime contains: Sulphur (flowers, or ground sulphur) 1 lb., good stone lime ½ lb., water ½ gallon. This may easily be remembered and adapted to any size of cooking vessel. This should read about 28° Beaumé, corresponding with 1·2357 specific gravity. Experiments have shown that a solution containing 1 lb. sulphur and ½ lb. lime to 5 gals. of water is sufficiently strong for spraying dormant orchards. Such a solution has a specific gravity of 1·02. Sulphur-lime of any strength may be reduced to the 1 : ½ : ½ formula by the following calculation:—the decimal of the specific gravity of the concentrate, divided by the decimal of the dilute, gives the number of volumes of diluted spray obtainable from one volume of the concentrate. For instance, ·2357, the decimal corresponding to 1 : ½ : ½ sulphur-lime, divided by ·02, the decimal of 1 : ½ : 5, gives approximately eleven. One volume of the 1 : ½ : ½ strength will therefore dilute to eleven volumes of ready-to-use solution. If a factory-made sulphur-lime, testing, say, 34° Beaumé, or 1·3015 specific gravity, is used, its decimal ·3015, divided by ·02 would indicate fifteen volumes of spray solution. The hydrometer is thus a valuable instrument to the fruit-grower. The temperature of the liquid to be tested should be about 65° F. Crude oil emulsions are coming into favour, one point being the greater ease with which an oil spray spreads and penetrates, thus insuring a more thorough application than with the watery solution of sulphur-lime. The author gives the following formula: Soda 3 lb., hot water 10 gals., fish-oil soap 20 lb. (these form the emulsifier), crude oil 20 gals., and water to make up 200 gals. The soda should be dissolved first in the hot water followed by the fish-oil soap. This emulsifier is then added to the spray tank containing 167 gals. of water, and the agitator is run at full speed. The oil is then slowly poured in while the agitator churns the mixture into a coffee-and-milk-coloured liquid which contains 10 per cent. of crude oil. After the emulsion is made, nothing else, not even water, should be added, or the oil might separate. This California formula is based on a 200-gallon tank equipped with screw-propeller agitator and gasoline engine pump. In applying winter sprays it is important to cover every side of every branch. While most pests occur on the surface some few individuals hide behind the buds, in the cracks of the bark or at the tips of the branches. These neglected individuals are the ones that tide the species over the winter and make spraying again necessary in the following year.

Trabut (—). **A Propos des Plantations de Vignes francaises dans le Departement d'Alger Phylloxéré.** (On the Plantations of French Vines in the Department of Algiers infested with Phylloxera.)—*Bull. Agric. Algér. Tun. Maroc., Algiers*, xx, no. 3, Feb. 1914, p. 92.

M. Bertrand states that there is great danger in urging the vine-growers to plant French vines at this time, in the hope of being able to protect them from the attacks of *Phylloxera* by means of insecticides. None of the treatments of winter-eggs will prevent the young vine plants, which have been so imprudently planted, from being attacked by this pest.

Rutherford (A.). *Xyleborus compactus*, **Eichh., a Borer of Tea and Coffee.**—*Trop. Agric., Peradenyia*, xlii, no. 2, Feb. 1914, pp. 131-132.

In October 1913, the Entomologist received from Wattegama, specimens of tea plants from the nursery said to be attacked by shot-hole borer. Of these plants 50 per cent. were damaged, the point of attack being below the ground-level. The insect, though resembling *Xyleborus fornicatus*, Eichh., was at once seen to be a different species, and the beetles in each tunnel are much more numerous than in the case of *X. fornicatus*. It appears to be identical with specimens of a Scolytid received in September 1911 from Pelmadulla, where they had been attacking *Coffea robusta*, which Green regarded as almost certainly *X. coffeae*, remarking that this pest had not previously been recorded from Ceylon. It has been identified by Col. Winn Sampson as *X. compactus*, Eichh.

Norris (F. de la Mare). **Locust Work in December.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 7, Feb. 1914, p. 186.

The catch of locusts in Selangor for December was 1,500 tins, representing 400 swarms ; experiments have been carried out giving very favourable results, and it is hoped in dealing with the next generation to supplant the bag-trap system to some extent by the use of poisons. Flying swarms in various parts of the State have been kept under observation.

Springs (F. G.). **Notes on Indigo Planting in Malaya.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 7, Feb. 1914, pp. 187.188.

Attempts which have been made recently to cultivate indigo as a subsidiary crop amongst young coconuts and rubber at Kuala Lumpur, have shown that it is unlikely that this plant will do well, owing to the appearance of an insect pest. This is the larva of a moth (not as yet identified) which eats the leaves and young shoots. It is probable that if the cultivated area extends the pest will become more prevalent. In consequence, it is not deemed advisable for the present to extend the cultivation of indigo in Malaya.

FROGGATT (W. W.). **A descriptive Catalogue of the Scale Insects (*Coccidae*) of Australia.**—*Agric. Gaz. N.S.W., Sydney*, xxv, pt. 2, Feb. 1914, pp. 127-136, 1 pl.

The first part of a catalogue of Australian COCCIDAE is given, in which the species are described, with their mode of occurrence and distribution. In the present part, 14 species of the genus *Aspidiotus* are dealt with, of which three are new, namely *A. alatus*, occurring on the twigs and leaves of Eucalyptus at Dubbo and Wagga, N.S.W.; *A. confusus*, on the trunk and branches of a white gum (*Eucalyptus* sp.) at Narara; and *A. coralinus*, on the young foliage and branchlets of a scrub tree (*Eremophila sturtii*) near Bourke, N.S.W.

**Cacao Beetles and Thrips.**—*Bull. Trinidad and Tobago. Dept. Agric. Port-of-Spain*, xiii, no. 78, Feb. 1914, pp. 43-44.

F. W. Urich is reported to have stated (January 1914) that he had not met with any particularly severe attacks, but on many estates, beetles (*Stirastoma depressum*) and larvae were being caught in large numbers and the moment was opportune for spraying trees, especially those from three to five years old. The beetles are very active during the dry months and spraying should be done immediately. Urich recommends that posters be printed calling attention to the beetles and the methods of control, which should be put in conspicuous places in the badly affected districts. Thrips (*Heliothrips subrocinctus*) were on the increase. To prevent damage to the June crop, spraying is required before the new growth of leaves begins. At Sangre Grande some fields affected by thrips in 1911 and 1912 which were forked and limed in the latter part of 1912 were not seriously infested up to the present.

MCKILLOP (A. T.). **On the conversion of cotton sticks into charcoal for the destruction of the Pink Boll Worm.**—*Agric. Jl. of Egypt, Cairo*, iii, (1913), no. 2, 1914, pp. 127-129.

The pink boll worms, *Gelechia gossypiella*, are now present literally in millions, in the dry cotton bolls stored on the tops of the *fellahîn* houses. According to A. Andrés, the larvae form cocoons in the interior of the seeds and remain in a dormant state for as long as seven months, without requiring any nutriment. The storing of cotton sticks containing dried and diseased bolls, which afford protection to the moth and larva, allows the generation to be carried on from one season to another. It might be advisable to introduce into the ordinance now under reconstruction, a proviso that all cotton sticks be destroyed by fire or carbonized before a fixed date. It is obviously of importance to retain as much fuel as possible and the carbonization of the wood suggests a compromise of economic value. The inconvenience that cultivators will be put to is not a sufficient reason for refusing to carry out what will not only be a means of destroying and preventing the reproduction of the pink boll worm, but also of reducing the numbers of the common boll worm (*Earias insulana*). It is recommended that all cotton sticks be converted into charcoal before removal from the fields. A table is given of 11 results obtained by the *baladi* method in 7 districts. The return

of charcoal varied from 9 per cent. in one instance to 55 per cent. in another. The average return of charcoal was just under 34 per cent. It is thought that in the highest percentages (one of 55 and three of 48) the charcoal must have been damp when weighed and a large amount of dust included. The *baladi* method is as follows: The cotton sticks are closely packed into a pit about 20 inches deep by 16′ 8″ long and 6′ 8″ wide at one end and 3′ 4″ at the other, and heaped up to a height of about 4′ 2″ above ground-level; a layer of straw refuse, several inches deep, is spread over the surface, leaving a portion of the narrow end uncovered, which, for choice, should be the end from which the prevailing wind blows. Three or four ventilation holes are opened at the sides and the wide end, to regulate the draught. The sticks at the exposed end are there lighted, and when the fire has got a good hold the end is closed with straw refuse or some other damping material. During the process of burning, which may last from 24 hours to 3 days, water must be frequently applied to prevent the kiln from bursting into flame. Messrs. Kingsford and Crewe have patented a retort which will convert small lots of cotton sticks into charcoal in a few hours, and is capable of making from one-quarter to half a ton per day. It can be seen working at Gezîra. The calorific value of the charcoal is 7·420 as compared with that of cotton wood, 2·744. Ordinary charcoal is retailed in Cairo at £(E)8 to £(E)12 per ton. The cotton stick charcoal was readily bought at £(E)4 per ton and this price more than covers the expense of burning. In enacting complete legislation against the pink boll worm, it will be necessary to provide for its destruction in the field, as well as in the seed, at the time of ginning.

GROHMANN (—). **Die Generation des grossen braunen Rüsselkäfers** (*Hylobius abietis*) **und seine Bekämpfung.** [The large brown weevil (*Hybolius abietis*), its reproduction and control.]—*Tharandter Forstliches Jahrbuch, Berlin*, lxiv, no. 4, 1913, pp. 325-361, 3 figs.

The available knowledge concerning the reproduction of the pine weevil, (*Hylobius abietis*) and control measures against it, is very insufficient. Since 1909, the author has made a study of its life-history, which has been facilitated by a system of trapping devised by him primarily for the destruction of the pest. The trap is made by digging a hole measuring about 2 feet each way. If the soil removed is not sandy or loose, it must be reduced to a uniform fineness, free from large roots or stones. Eight to twelve posts of fir, with one end sharpened to a point, are driven into the hole at regular distances until their tops are only about 8 inches above the edge. They should be about 3 to 4 inches thick at the top and their length—excluding the sharpened point—about 32 inches. The fine soil is then put back till the hole is filled level with the ground. Fir branches about 3 to 5 feet long are then laid flat on the ground between the posts with their tips outwards and their stems inwards. Ordinary soil, freed from very large roots and stones, is then strewn over a surface extending from the centre to about a foot beyond the posts and packed in round the branches and the posts. A stratum of soil about 2 inches deep is then spread over the branches and on this another layer of branches is laid as before. This process is repeated until the posts are buried some

6 inches deep. In this manner a small mound is erected with edges fringed with green twigs. Instead of fir, pine may be used for the posts and branches, but the former is much to be preferred. The author states that these traps attract the beetles, which remain there during mating and oviposition, so that specially threatened plantations may thus be saved. They also afford a refuge and breeding place for many reptiles and insects which prey upon *Hylobius* in all its stages.

On being fecundated, the female goes into the heap in order to lay her eggs under the bark, in the cambium of the branches and posts, preferring places where the bark has been damaged and pieces of it have been removed. The eggs are laid singly in May, and oviposition continues through the summer and even until the end of September. Most of the eggs are laid in June, July and August. The author states that after reproduction, all the adults emerge from the traps and die in the open. This view is based on the fact that living individuals were only found in the traps from May to October and principally from June to August, whilst none have been found hibernating in numbers anywhere in the German forests. The author believes that the few which have been found are late autumn broods which have not had an opportunity of breeding.

On beginning to feed, the larvae first make galleries under the bark, in the cambium and also in the young woody fibres and later penetrate into the sap-wood. Their growth is complete after the third month and their size then varies from $\frac{4}{5}$ to 1 inch. In the traps the larvae developed in the thick portions of the branches as well as in the posts. The pupal stage lasts about a fortnight, and the whole normal development occupies about 15 months. This time may be varied by circumstances to anything between 13 and 22 months. The author states that the beetles which appeared in clearings or young plantations in April, May and June, 1913, were hatched from eggs laid from July to September, 1911. The beetles appearing in July, August and September, 1913, hatched from eggs laid from May to July, 1912. Beetles completing a long reproductive cycle appear in the spring, and beetles starting a long reproductive cycle appear in the summer.

Besides *Hylobius abietis* the traps were also used by *H. pinastri*, *Pissodes notatus*, *Hylesinus piniperda* and *H. cunicularis*. Other inmates were: slow-worms (*Anguis fragilis*, L.), various lizards, Hemiptera, spiders, ants, centipedes, millipedes, Staphylinids, Elaterids, ground-beetles, and Braconids. The larvae of the Elaterids and of the ground-beetles seemed the most active destroyers of *Hylobius* larvae. Of the ground-beetles those most frequently met with in the traps were: *Pterostichus oblongopunctatus*, *Abax striola*, *Carabus auratus*, *C. cancellatus*, *C. granulatus*, and *C. violaceus*. The Braconid eggs were laid in the *Hylobius* larvae; the author also found numerous white, very thin wire worms $\frac{1}{5}$ inch long, which he believes feed on *Hylobius* larvae. It is further certain that the beetle has many other enemies besides those mentioned here.

This beetle is able to scent freshly cut timber at considerable distances, and clearings become centres for further infestation. So far, all control methods have failed and at present the pest is allowed to levy a heavy toll quite unchecked. A record is given of the various measures hitherto tried. The author is positive that the traps described

here, provide a sure means of combating *Hylobius abietis*. They have been subjected to tests extending over a number of years and have given excellent results, both in the mountains and in the lowlands. In the numerous trap inspections personally carried out by the author, large numbers of natural enemies were found. An important point is that depressions in the ground must never be used as sites for traps. Wherever possible the latter should be placed on high ground. They should be constructed as directed, but exaggerated accuracy is not necessary. According to the distance from which the branches were brought, the cost of each trap ranged from about 9d. to 15d., the value of the wood not being included. The cost per acre varies according to the control desired, as set forth below. Traps should at once be constructed where (1) it is desired to protect the edges of a plantation; (2) the areas infested by the beetle are required for planting, (3) beetles are unusually numerous on any particular spot. Edge protection is nearly always necessary on the sides of a clearing, especially where it borders on young plantations, and it should also be carried out where young plantations border on old ones in which much timber has been felled. In cases where the timber has been cut down in summer, the traps must be constructed immediately. Where clearing has been done in winter, they should be prepared about the middle of April. In any case they must be ready by the time the beetle begins to feed. At first the traps may be placed at intervals of about 60 yards. As it is important that freshly baited traps be constantly present, new ones may be constructed along the same line later on at distances of 20 yards. For instance, a line of traps 60 yards distant one from another is constructed by the middle of April, and added to at the beginning of June and again about the middle of July. Thus, if the line has 10 traps at the start there will be 30 at the end of the campaign. Early in spring the traps must be dug up and the soil spread evenly around the hole. The posts and branches, with the beetle brood contained in them, are burned. There need be no fear that any natural enemies will be sacrificed, as but very few will still be present. If this system of protection is required to be renewed a second or third year, the old holes may be used to save expense. Where clearings left untouched during one summer are to be replanted, they should be studded with traps if beetles are present. Only a few traps are required for this purpose, one being sufficient for every 2,500 square yards approximately. These traps should be established immediately the replanting is effected and will chiefly serve to catch fresh arrivals. To deal with the beetles native to the spot, well-baited traps must always be present. To ensure this, two new traps should be constructed near the old ones at fortnightly intervals starting from about the middle of July. Thus a clearing which has lain untouched for a year will contain four traps to every $2\frac{1}{2}$ acres in spring and this number will increase to 12 traps by the end of the year. In the following spring the traps must be cleaned out and the posts and branches burned. Four of the traps must then be re-constructed, and they will serve to catch the beetles resulting from eggs laid late in summer two years before. It is well to duplicate each of these four traps in July or August to catch beetles appearing in those months from eggs laid when the replanting was in progress. This second year's batch of eight traps must be cleared as usual in the following spring and control

may be considered as accomplished. Should further injury be noticed, it is due to beetles from neighbouring timber, and therefore it is advisable to continue the edge-protection mentioned above for some time longer. Where beetles are to be combated on clearings which have been untouched for two years, the same method is used as for protecting a plantation in the second year of its growth. For instance, after such plantation has had edge-protection during the spring and summer of 1912 and 1913, it must be provided with four traps per $2\frac{1}{2}$ acres to start with and one or two extra traps must then be added in July or August. In this case, control may be considered complete when the traps are cleaned in the following spring. A great advantage of delaying replanting until two summers have passed is that such replanting escapes the period when the beetles are most abundant. Where replanting is carried out after one summer only, great care is necessary for the properly-timed construction of the supplementary traps, or damage will be done to the young trees.

Where the aim is to destroy *Hylobius abietis* without any thought of protecting plantations, the best time for setting the traps is when the pest is most abundant. If clearing is effected in winter, then the following months of July and August are best suited. If effected, say, in August 1914, then the favourable time would be in April 1916. The time at which this system of trapping should begin is strictly regulated by the data given above as to the life-cycle of the weevil. The system is simpler than it appears at first sight and the author publishes it with the conviction that many a pine and fir plantation will be saved by means of it.

NEGRI (U.). **Il Rinchite del Mandorlo.** [The almond *Rhynchites*.] —*Boll. Catt. Amb. d'Agric., Brindisi*, viii, no. 2, Feb. 1914, pp. 12-13.

The author has observed the first two generations of the *Rhynchites* which infests the almond, a tree of great economic importance in Puglia (where the pest is called *campa* or *campio*) and in Sicily. About the end of February or the beginning of March, the females pierce the buds and deposit in each, one egg from which a yellow-red larva emerges. This feeds in the bud, working in a circle and covering the pistils with a silky froth which prevents the bud from opening. The larva completes its cycle within the flower during the period of pollination, which varies from 15 to 20 days. It appears as a perfect insect just about the time that the fruit acquires its shell and pierces the tiny fruit with its proboscis in order to deposit the eggs for the second generation. This injury causes the fruit to fall and where infestation is severe the crop is lost from that moment. The author has observed that when two larvae meet the stronger devours the weaker.

FUCHS (—). **Ueberblick über die forstliche Entomologie.** [A brief survey of Forest Entomology.]—*Entom. Zeitschr., Frankfurt a. M.*, xxvii: nos. 24-26, 28-30, 32-36, 39-42, 44-45; 13th Sept. 1913—7th Feb. 1914.

The author deals with all the forest insects of Germany, giving a full account of those of economic importance and a cursory notice of others. The subject matter is arranged on a systematic basis, in order

to avoid the repetition entailed by the handling of the subject according to timbers. The text contains numerous figures illustrating the insects and the injuries they cause.

P. F. **Die Organisation der Wurmbekämpfung mit Nikotin.** [The organisation of vine moth control with nicotin.]—*Luxemburger Weinztg, Grevenmacher*, ii, no. 3, 1st Feb. 1914, pp. 37-40.

Control of vine pests, particularly that of the vine moth, demands the united action of all vine-growers in order that the cost of material may be reduced and success ensured by speedy application. The flight of the moths only lasts from 8 to 10 days and it is necessary to use all available means in that period. A system of co-operation would be a great help. If spraying with nicotin were carried out in every vineyard, one application would probably suffice per year, but where control is not universal, two applications are required.

Zschokke (A.). **Massnahmen zur Hebung des Weinbaus.** [Measures for the improvement of viticulture.]—*Weinbau der Rheinpfalz, Neustadt a. Hdt.*, ii, no. 3, 1st Feb. 1914, pp. 26-32.

The area devoted to viticulture in Germany is shrinking, and furthermore the site value of vineyards is now only $\frac{2}{3}$ or $\frac{1}{2}$ that of about 20 years ago. One of the three reasons given by the author is the more difficult and more costly working of vineyards. It is necessary to plant vineyards in such a fashion that pest control may be rendered easy and attainable with the smallest possible outlay of time and labour. One necessary reform is the abolition of cross-baulks. Wherever possible, wood must be replaced by stone, iron, and iron wire. Planting in rows will permit the plough to be used for turning up the soil. The fastening of the summer-shoots with straw is obviated by passing them between two wires. Spraying associations will cheapen, simplify and speed up the application of insecticides. Co-operative buying will effect saving in purchasing material. Lastly, the small grower will save by abstaining from experimenting with all kinds of secret preparations.

Shtchegolev (I. M.). **Вредныя насѣкомыя и болѣзни растенiй, наблюдавшiяся въ Таврической губернiи въ теченiе 1913 года.** [The injurious insects and diseases of plants noticed in the Govt. of Taurida during 1913.] **« Отчетъ о дѣятельности помощника Губернскаго Энтомолога Таврическаго Земства за 1913 годъ.»** —[*Report of the Assistant-Entomologist of the Zemstvo of the Govt. of Taurida for* 1913.] *Simferopol*, 1914, 24 pp.

The author begins his report with the remark that the last year can be called a "year of *Lymantria dispar*," as this was the principal pest, appearing over an area of some 54,000 acres and threatening to play havoc with forests and orchards. It was evident in the preceding autumn that an outbreak might occur, indicated by the large amount of eggs deposited; an examination of the forests confirmed these fears. The author mentions the precautions taken by the Station in order to acquaint the population with the threatened danger and with the remedies which ought to be immediately applied. Certain orchards,

though situated in the most threatening surroundings, near forests and mountains from which the caterpillars were constantly brought by the wind, had full leafage, as their owners conducted the fight against the pests energetically ; while, where no remedies were applied, the trees were quite leafless and gave no harvest. At first when the caterpillars were small and were being transported by wind, constant care was necessary, the measures adopted being, spraying with Paris green or with the latter mixed with Bordeaux liquid, and shaking the caterpillars from the trees. Owing to the small doses of poison applied there was some delay before the caterpillars were destroyed ; some owners tried tobacco dust, but without beneficial results and had to return to the above-named insecticides. The author thinks it a matter of regret that nowhere has Djipsin been tried, as this is a stronger poison than Paris green and causes no injury to the leaves. When the movement of the caterpillar ceases, the principal remedy consisted in bait-belts, which proved very valuable, although most owners had no sticky material of a good quality. [See this *Review*, Ser. A, ii, p. 274.]

The author proceeds to deal with the following pests :—*Psylla pyri*, L., has not done much damage, although an outbreak was expected in view of the great amount of eggs. It is assumed that the cold winds prevailing during the hatching time of the larvae had a prejudicial effect.

*Hoplocampa brevis*, Klug, has injured a great number of ovaries of pear trees in some localities in Alushta ; beyond shaking down from the trees, no remedies were applied, although spraying of the unfolded buds with milk of lime or carbol-emulsion might have prevented much harm.

*Anthonomus pomorum*, L., multiplied in great numbers and has done serious damage to ovaries of apple and pear trees in many parts of the country. Very often the owners mistake the damage done by this pest for that caused by frosts and take no measures against it ; shaking down from the trees and belts early in spring are suggested. The damage actually done was to some extent diminished owing to the early blossoming of the trees and to the late appearance of the weevils, which occurred in many places after the fruit was set. *Ryhnchites pauxillus*, Germ., appeared as usual, and *R. bacchus*, L., did noticeable damage to apple trees in some localities.

*Cydia* (*Carpocapsa*) *pomonella*, L., appeared in great numbers ; in some orchards, as many as 150 caterpillars were found underneath one belt. A large number of caterpillars hibernated, special attention should therefore be paid to the bark of the trees.

*Aphis* on apple and pear trees appeared nearly everywhere. The fight against these lice in the Crimea is made more difficult owing to their appearance at the time when the trees are first sprayed with Bordeaux liquid and Paris green, which fungicides do not affect the pests and at the same time make it troublesome to repeat the spraying with other insecticides ; when this is done later, the lice have already curled the leaves and thus formed some sort of protection for themselves against the poison.

*Eriocampa adumbrata*, Klug, caused great devastation in the lower parts of the river Katcha ; the larvae attacked mostly cherry trees, but also apple, pear and nut trees ; it was impossible to apply remedies, as the time of the outbreak coincided with the cherry harvest. The

author remarks that such an outbreak has not occurred for many years.

*Luperus rufipes*, Scop., was observed in noticeable numbers on some apple trees, as well as on alder trees, in the valley of the river Alma. *Galeruca crataegi*, Bach. (*xanthomelaena*, Schr.) appeared in some parts round Simferopol on elms. Some species of *Lecanium* probably *L. corni*, Bouché, were found in large numbers on apple trees in one locality, where they have never previously appeared. It is assumed that the pest migrated from the forests to the gardens. *Lyonetia clerkella* appeared in extraordinarily large numbers, being absent only in a few fruit gardens and on scattered apple trees. This outbreak has not resulted in serious damage, only the trees attacked early in the season having suffered seriously.

*Choreutis parialis*, T., also appeared in enormous numbers in the orchards along the river Katcha. The following remedies are suggested: spraying with Paris green or with Bordeaux mixture and Paris green, and applying belts so as to prevent the caterpillars which have been thrown from the trees by the spraying from getting back; the spraying must be done at the end of June, before the caterpillars have got underneath the ends of the leaves. *Hyponomeuta malinellus*, Z., did not do serious damage, although appearing in large numbers. It was noticed that the increase in the caterpillars was quite suddenly arrested. This is explained by the great multiplication of their parasites, which succeeded in stopping their spread.

The first generation of *Phlyctaenodes sticticalis* seriously damaged market-gardens, orchards and grasses, and the moths of the second generation hatched out in enormous quantities, but perished without ovipositing. The aphis, *Brachycolus noxius*, Mordw., did noticeable damage to winter-sown crops in the district of Eupatoria, although their numbers were much less than last year.

**Борьба съ вредными насѣкомыми въ лѣсничествахъ Тамбовской губерніи въ 1913 году.** [The fight against injurious insects in the Forests of the Government of Tambov in 1913.]– **«Лѣсная Жизнь и Хозяйство.»** [*Forest Life and Economy,*] *Tambov*, no. 6, March 1914, pp. 15-18.

Injurious insects in the forests of the government required less attention in 1913, owing chiefly to the fact that it was not a cockchafer year. In the three forest areas in which organised collections of *Melolontha melolontha* took place, only 1,314 lb. were obtained as compared with over 26½ tons in the previous year. In the forests of Vindreev and Fastchevsk, tobacco dust was either scattered over the ground or dug into the soil. The efficacy of this method is still in doubt as there has not yet been time to test it properly.

In the pine plantations of the forest of Gorielsk, an undetermined insect which attacks the young shoots did considerable damage in 1912; in 1913 the collection of these insects were undertaken. Their presence in the trees could be ascertained by thick swellings on the attacked shoots, marking the place of entry and smeared with a resinous exudation, most of the attacked pines being covered with web. In order to extract the pest from the shoots, the latter were carefully tapped with sticks. During May and June some 197,000

insects were collected in this way on an area of 305 acres; the shoots from which the insects were extracted recovered and it is suggested that this method should be applied again in 1914. *Euproctis chrysorrhoea* appeared in the forest of Borisoglebsk, where its webs were collected from oak trees over an area of 453 acres.

In the district of Pri-Usman, in forests consisting chiefly of birch and oak, with a mixture of aspen, operations against *Retinia* were undertaken, consisting of cutting off and burying the branches on which the larvae had begun their attacks; and it is thought that in 1914 the damage by these insects will be less.

*Lophyrus pini* appeared in the forest of Bokin and *Hylobius abietis* in that of Pushtin. In the forests of Romanov and of Jarov, *Lophoderium pinastri* was noticed in nurseries and the seedlings were twice sprayed with Bordeaux mixture, after which they recovered in one area. About 15 per cent. of the seedlings perished from this pest.

UVAROV (B.). **Задачи и программы дѣятельности энтомологическихъ учрежденій.** [The objects and programmes of the local entomological institutions.]—**«Земледѣльческая Газета.»** [*The Agricultural Gazette*], *St. Petersburg*, nos. 3 & 4, 1914, pp. 74-76 & 114-115.

The question as to the best types of local entomological institutions was raised at the First Russian Conference on Applied Entomology in Kiev in August of last year, and although the time at the disposal of the Conference did not allow of a thorough discussion of the problem, the idea which met with general approval was that it is necessary to distinguish clearly between the objects of Entomological Stations or Branches of Agricultural Experimental Stations and of Entomological Bureaus. The author points out that Entomological Stations must be chiefly concerned with the study of insect pests under natural, as well as experimental, conditions; this can be best arrived at when the Entomological Stations are connected with, and form a branch of, the General Agricultural Experimental Stations. The work of Entomological Bureaus should be confined to acquainting the public with the results of scientific studies and giving practical assistance to them in fighting various injurious insects. Their objects should include the popularisation of entomological knowledge by means of posters, pamphlets, lectures and of object lessons and experiments; the publication of local popular literature of a periodical character and the giving of advice as to the necessary current work in field and garden at each season.

The author further urges that the Bureaus should undertake the organisation of measures against pests, for which purpose special funds ought to be placed at their disposal; he does not go into the question of how these funds are to be raised, as the answer to this may vary in different localities. These Bureaus should, he thinks, be far more numerous than the first-named type of Stations, and their work will be of considerable help to the latter in accumulating experience and practical data.

Mokrzecki (S. A.). **Вредныя насѣкомыя и болѣзни растеній, наблюдавшіяся въ Таврической губерніи въ теченіе 1913 года.** [The injurious insects and diseases of plants noticed in the Govt. of Taurida during 1913.]—**« Отчетъ о дѣятельности Губернскаго Энтомолога Таврическаго Земства за 1913 годъ.** [*Report of the Chief Entomologist to the Zemstvo of the Govt. of Taurida for* 1913], *Simferopol*, xxi, 1914, 13 pp.

The author deals only with certain points of importance regarding the insect pests noticed during the year under report, more detailed information being contained in the report of his assistant. He deals first with *Brachycolus noxius*, Mordw., which did enormous damage in 1912, decreasing the harvest in the area infested by 75 per cent. The author suggested ploughing the soil carefully for winter-sown crops and sowing them as late in the season as possible ; in all places where these remedies were acted upon, the state of the crops in the spring of 1913 was very good. However in April 1913, the aphids appeared on trap crops of winter-sown wheat, which, in the form of a 7 ft. wide strip, surrounded a field of 918 acres ; these trap strips were sown early, at the end of the preceding summer, as a protection against *Mayetiola* (*Cecidomyia*) *destructor* and owing to their specific purpose could not have been reploughed ; the sowing on the field inside this strip was carried out later. The author found that colonies of lice existed only on the trap strips, while the crops on the field were free from them ; he recommended mowing the trap crops and re-ploughing the land, and after this had been done no more lice were noticed. Some time later colonies of lice appeared also on some other plots of a total area of 378 acres, which had to be reploughed, the District Zemstvo compensating the owners at a rate of 7s. 6d. per acre.

Examination of the plants at this season resulted in the discovery, in the central shoot of the grain, of colonies of lice consisting of one adult and up to a dozen young larvae ; the first nymph was noticed on the 1st May. Some syrphid larvae were also found in each colony attacking the lice. This led the author to consider that winter-sown wheat would not be injured by the pest, but that barley and oats might be damaged ; the result confirmed this view and only after the second half of the summer did the number of lice increase and some sporadic damage occur. Special investigations on *Brachycolus* were conducted during this summer by N. A. Grossheim, particularly in respect of their parasites, oviposition of winter eggs, etc., and a report on these investigations will be issued. The author points out that *Brachycolus noxius* lays its winter eggs on the germinating shoots of fallen grain and recommends the careful removal of all such grain. He mentions that the District Zemstvo of Eupatoria has decided to appoint a district entomologist, principally to study and deal with this pest. Crops of winter-sown wheat in the same district were also damaged by some small velvet black mites with yellow legs, the identity of which has not yet been established ; these mites suck the lower leaves of the seedlings causing them to wither ; they are to be found in groups on the axils of the leaves and are very easily disturbed.

The next pest dealt with is *Lymantria dispar*. The author refers to his observations regarding this pest in his last year's report [see this *Review*, Ser. A, i, p. 361–364] and to the remedies there suggested.

The hatching of the caterpillars this year commenced on the southern slopes of the mountains in the middle of March, while on the northern slopes it took place after the end of the month and continued during nearly the whole of April. The number of the caterpillars was enormous and parasites (*Hadronotus howardii*, Mokr.) were then very seldom found; only in case of egg-masses smeared with naphtha or kerosene did the eggs fail to hatch. The young caterpillars were transported by the wind and got into orchards, where they did considerable damage, especially to apple trees; but after the middle of May the numbers began to decrease, owing to parasites, such as *Apanteles fulvipes*, Hal., and *A. solitarius*, Rtz., and in June the orchards and woods were practically free. Apart from the effects of the parasites and of a fungus disease similar to flacherie, it was observed that many of the insects were dwarfed, while there was a considerable prevalence of males over females and a decrease in the number of eggs laid. The size of the dwarfed moths was only half the normal; the percentage of males was in some cases 88 per cent., and while the normal females have up to 1,200 eggs in their ovaries, the dwarfed ones had only 60. The females hatched out were so weak that they perished without unfolding their wings and before they laid any eggs. Caterpillars collected in June in the forests of the Crimea were also infested by Tachinids and of 2,000 adult larvae collected in one wood, only 32 per cent. produced imagines, while the remainder were killed by parasites. The author thinks that the year 1914 will not witness the appearance of the pests in any noticeable degree, except in those spots to which the caterpillars have been carried by the wind and have found specially favourable conditions. I. M. Shtchegolev undertook the statistical part of the investigations, while the author, in company with Miss A. P. Bragina, studied the biology, parasites of the pests and the effect of various insecticides. These studies will be continued this year. He mentions some facts observed which are in conformity with the conclusions of American investigators; pure pear plantations were little damaged, while when mixed with apple trees the former suffered more, and the latter less. Pure beech woods are practically left untouched by the pests, but when scattered amongst oak trees they diminish the injuries to oak, while suffering themselves. The same is also the case with regard to pines, which are totally devoured when situated amongst deciduous trees. Conifers are only touched by the first generation of caterpillars, as observed by Shtcherbakov.

Observations conducted at the Experimental Station of Salgirka have shown that there are various species of *Psylla* in the Crimea, the following having been identified by Dr. Karol Sulc., of Moravia:—*Psylla pyrisuga*, Först., *P. melanoneura*, Först., *P. albipes*, Flor., *P. pyrarboris*, Sulc., *P. horvathi*, Sulc. The first two species have occurred in large numbers on pear trees, *P. pyrisuga* having one generation, and *P. melanoneura* two. Up till now it has not been definitely established which species live on apple trees and which on pear, and this has led to mistakes and to conflicting statements by various authors.

The last pest dealt with by the author is *Cydia* (*Carpocapsa*) *pomonella*, L., which was studied by Miss A. P. Bragina and I. V. Nikitin. Owing to the wet and rather cold summer, only one generation and a

portion of a second were produced during the year. Out of hundreds of eggs of *C. pomonella* only one parasite was obtained, identified by N. V. Kurdjumov as *Trichogramma fasciatum* (Perkins); as no more eggs of *Cydia* were present the parasite was offered eggs of *Euproctis chrysorrhoea* and of various species of *Mamestra*, *Agrotis*, *Leucoma*, *Catocala* and others, also eggs of spiders, all of which it attacked. From one egg, from 2 to 21 specimens of the parasite were obtained and during 7 months 11 parthenogenetic generations were bred.

The Stations have also conducted observations on *Tmetocera ocellana* and on a Tenthredinid sawfly. The latter pest has done considerable damage to strawberries in the district of Berdiansk; it multiplies parthenogenetically, although both males and females have been observed. Spraying with Paris green in May is recommended as a remedy.

FUSCHINI (C.). **Di un fattore non sufficientemente studiato nella utilizzazione dei microorganismi parassiti d'insetti nocivi.** [An insufficiently studied factor in the employment of micro-organisms parasitic on injurious insects.]—*Riv. Vitic. Enol. Agrar., Conegliano,* (5) xx, no. 4, 15th Feb. 1914, pp. 74-76.

The use of parasitic micro-organisms, to assist the agriculturist against his insect enemies, only dates back some 20 years. As in the case of predatory and endophagous insects, quite a new field has been opened up. It is presumed that microparasites exist, capable of reducing the numbers of most injurious insects to a negligible quantity under given conditions. The author holds this last qualification to be the important factor to be studied, if it be desired to reproduce the epidemic artificially. The receptivity of the intended victim is quite as important for infection as the presence of the parasite. The non-success recorded by Lounsbury in infecting locusts with *Coccobacillus acridiorum* is probably due not only to a loss of virulence before use, as suggested by him, but also to defective receptivity on the part of the locusts. The conditions which influence the virulence of the microparasites and the receptivity of their hosts must be studied with equal care.

ISSLEIB (—). **Die Beseitigung der Insekten, welche den Wein- und Obstbau schädigen, durch Verklebung mit Hilfe von Moosschleim.** [The removal of insects injurious to orchards and vineyards by sticking them with seaweed mucilage.]—*Zeitschr. Pflanzenkrankheiten, Stuttgart,* xxiv, no. 2, 28th Feb. 1914, pp. 78-79.

The author believes the employment of seaweed mucilage to be a new and promising method of insect pest control. The mucilage is prepared by boiling 4 lb. of Irish Moss or Iceland Moss (*Fucus caragahen*) in 20 gals. water for one hour, whatever is lost by evaporation being made up. After straining, a thick, slimy liquid results. On drying, this leaves a thin skin which gradually comes away in flakes. If the mucilage is sprayed on infested plants, the pieces which come away will be found to include the eggs and larvae of the pests. The spray must be applied only on dry days as rain will wash away the

mucilage and prevent the skin from forming. Still more effective results are attainable by adding 2 lb. of ethereal oil of mustard, dissolved in 10 lb. of methylated spirit, to every 2,000–4,000 lb. of mucilage. This addition must only be made after the mucilage has thoroughly cooled; other insecticides may also be combined with the mucilage. Starch-paste appears to behave in the same manner as seaweed mucilage, but its sticking and killing powers seem less. A sprayer giving a fine jet is required and thoroughness in application is necessary. In spraying for *Clysia ambiguella* in vineyards, not only the stocks but also the stakes and the surrounding ground must be wetted in order to include the eggs on the withered leaves and elsewhere. The development of the moth will regulate the spraying dates, which may be about the middle of April, then before and after flowering, and again after gathering the grapes. This method appears particularly suited for vine moth control. Mustard oil must be used with care as many varieties of the vine are injured by it. A few trials should be made and it is necessary that the face and hands of the operator be protected. The cheapness of the material favours its widespread employment. If prepared at home, 100 lb. of mucilage with $\frac{3}{4}$ oz. of mustard oil will cost about 2s. The mucilage alone is sufficient for control if used in time and with regularity.

**Poisoned branmash for cutworms.**——*Ninth Ann. Rept. Ontario Vegetable Growers' Assoc.* [1913], *Toronto,* 1914, p. 79.

Onions are subject to serious attacks by certain cutworms which sometimes appear in great numbers in spring and early summer, and frequently do severe injury before their ravages are noticed. They cut off young plants at the surface of the ground and being voracious feeders may destroy many plants in a single night. The usual method of control is by the use of poisoned baits. To a bushel of bran, $1\frac{1}{2}$ lb. of arsenic, or Paris green, is added and mixed thoroughly into a mash with 8 gals. of water, in which has been stirred $\frac{1}{2}$ gal. of sorghum or other cheap molasses. After the mash has stood for several hours it should be scattered in lumps of about the size of a marble at the bases of plants in fields where injury is beginning to appear. It should be applied late in the day, the cutworms being most active at night.

**La désinfection des Plants de Vigne.** [The disinfection of vines for planting.]—*Rev. Agric. Vitic. Afr. Nord, Algiers,* xii, no. 106, 21st March 1914, p. 269.

The Service Phylloxérique of the Swiss Department of Agriculture has just recommended the following method of disinfecting vine plants intended for planting. The plants are dipped for 12 hours in a solution prepared by dissolving 2 lb. of soap in 30 gals. water and adding 6 lb. of potassium sulphocarbonate with constant stirring. The roots of the plants must be well covered by the liquid, which must not, however, touch any of the shoots. A thorough washing of the plants completes the treatment, which appears to give perfect results.

## NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

## CONTENTS.



(C 30.)

## CONTENTS—*continued.*

VOL. II. Ser. A. Part 6.—pp. 337–408. JUNE, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.

THE EARL OF CROMER, G.C.B., O.M., G.C.M.G., *Chairman.*

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. AUSTEN, Entomological Department, British Museum (Natural History).
Dr. A. G. BAGSHAWE, Director, Tropical Diseases Bureau.
Sir J. ROSE BRADFORD, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., A.M.S.
Dr. S. F. HARMER, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.
The Hon. Sir JOHN McCALL, M.D., Agent-General for Tasmania.
Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.
Sir JOHN McFADYEAN, Principal, Royal Veterinary College, Camden Town.
Sir PATRICK MANSON, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir DAVID PRAIN, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. READ, C.B., C.M.G., Colonial Office.
The Honourable N. C. ROTHSCHILD.
Mr. HUGH SCOTT, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. SHIPLEY, F.R.S., Master of Christ's College, Cambridge.
Sir STEWART STOCKMAN, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. THEOBALD, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. J. A. C. TILLEY, Foreign Office.
Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

### General Secretary.
Mr. A. C. C. PARKINSON (Colonial Office).

### Director and Editor.
Mr. GUY A. K. MARSHALL.

### Assistant Editor.
Mr. W. NORTH.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.
*Publication Office.*—27, Elvaston Place, London, S.W.

ZNAMENSKY (A. V.). **Почковый долгоносикъ.** [*Sciaphobus squalidus*, Gyl.]—**«Труды Полтавской Сельско-Хозяйственной Опытной Станціи.»** [*Studies from the Poltava Agricultural Experimental Station*], *Poltava*, no. 20, 1914, 32 pp. 5 figs., 2 plates.

In a short preface, N. V. Kurdjumov points out that this paper represents the results of three years' work conducted at the Station under his supervision, first by I. V. Nikitin and then by the author. The former's investigations have supplied valuable data as to the parasites of *S. squalidus*, while the latter has succeeded in discovering various important points in the bionomics of the larva.

I. K. Paczoski, in 1897–98, first recorded the damage caused by this weevil in Russia; in 1903, Mokrzecki recorded the insect amongst the pests of the vine, and since 1910 it has been mentioned in the reports of various other entomological stations (Kiev, Smiela, Stavropol and Kishinev); but at the same time, no mention of the insect occurred in many reports from districts (Kursk, Ekaterinoslav, Poltava, Charkov) where it exists in vast numbers and does enormous damage. In European Russia the insect is found over the whole of the South, including the Crimea and the North of Caucasus; it has been found in the governments of Kursk, Kiev, Charkov, Poltava, Cherson and Bessarabia, but probably it exists also in many others. In many districts infested by *S. squalidus*, there occur isolated localities which are free from it, while all surrounding orchards are suffering from swarms of the insects. *S. squalidus* appears generally in the second half of April, but in 1913 it occurred in the first half of that month. While there are still few green plants, the weevils feed mostly on buds, attacking pears, apples, plums, cherries, apricots, and service trees, and raspberry, gooseberry and currant bushes, besides many forest trees. In the government of Poltava it was never found on *Fraxinus excelsior*, *Gleditschia triacanthus*, or white and yellow acacia trees. The majority remain on fruit trees and bushes, damaging the buds, including the flower buds, which sometimes wither and fall off. The percentage of injured buds ranges from 36 to 50 per cent. It is very easy to distinguish the damage done by *S. squalidus* from that done by *Anthonomus pomorum*; it eats out larger holes of irregular form, not round, as is the case with the latter species. The ovaries of the female are quite undeveloped when the beetles emerge, and the maturing of the eggs takes from 3 to 4½ weeks; the males are quite mature on emergence. Oviposition starts every year on approximately the same day, the 10th May, in 1911 and 1913, while in 1912 it was two days earlier. The eggs are deposited underneath the turned-over edge of a leaf, or occasionally between two leaves stuck together; the process of oviposition is described. In captivity the females oviposited freely on leaves of *Pirus aucuparia*, Garth, and on raspberries, but only a few on leaves of *Urtica*; in the open in the garden of the Station, the same preference for *Pirus aucuparia* was noticed; the eggs were frequently found also on apple, pear and plum trees, as well as on oak, *Euonymus*, *Ulmus pedunculata* and very often on *Corylus avellana*. Only once were eggs found on clover. Most of the eggs are deposited during one week, after which the beetles gradually disappear, so that only single specimens can be found at the middle of June. The same mode of oviposition is common also to *Eudipnus micans*, F., the eggs

(C37) Wt.P86/57. 2.4.14. 1,500. 6.14. B. & F. Ltd. Gp.11/3

laid by the latter being however more numerous and turning brownish after 3–4 days, while the eggs of *S. squalidus* remain white.

The eggs hatch in about 12 or 13 days, and the larvae immediately drop to the earth. Paczoski previously assumed that the larvae live in the earth and the observations in 1912 by Nikitin supported this; the author's investigations have also proved that the larvae feed on the roots of trees and that they pass two years there before pupating. Large larvae were discovered along the roots of a service tree and microscopical examination of their intestines showed the presence of tissues of bark (liber), the roots bearing clear evidence of injury; the same results were also obtained experimentally. The larvae which emerge in spring do not finish their development the same year, but pupate only in August of the following year, producing beetles in September which winter again and issue from the earth only in the following spring. The author has not been able to ascertain the number of moults and only once did he find a freshly moulted larva with the old skin still near it; usually the larvae devour the old skin. The pupa lies at a depth of 18–25 inches, which is also the average depth at which the larva lives. It is assumed that *S. squalidus* belongs to the type of insects which periodically multiply to enormous numbers, doing great damage in these years and afterwards gradually disappearing to quite negligible quantities; the years 1897–1898 were years of its minimum, the numbers increased during the following years and they have decreased again during the past three years. This is attributed to the activity of parasites.

The imago, larva and pupa of *S. squalidus*, owing to their subterranean habit, have few dangerous enemies; thus only the eggs are exposed to attacks of various parasites. Chief amongst these must be placed *Anaphes* sp., of the family MYMARIDAE, which is to be described by Kurdjumov; the infection of the eggs by this parasite is given as 52·4 per cent. for last year. They were mostly infected on the day on which they were laid, and the development of the parasite occupied 10–11 days in the insectarium. The process of oviposition of the parasite is fully described, the ovipositor being driven through the leaf with which the eggs of the hosts are covered. Evidently the sticky material ejected by the female beetle to hold the leaf in place provokes the desire to lay eggs in the parasites; for they drove their ovipositors through a leaf from which all the eggs were removed, but paid no attention to eggs offered without a leaf. Only those eggs which were infested early in their development produce parasites; when the embryo of the host has already developed there is evidently not sufficient nourishment left for the parasite, which perishes with the host.

Two species of *Eulophus* act as ectoparasites of eggs of *S. squalidus*. One of these species emerges from the pupa during the same summer, while the second one winters in the pupal stage on the same spot where the eggs of the host were situated. These species are not numerous and destroyed only about 9·2 per cent. of eggs in 1913. Each larva of the parasite requires 5–6 eggs of the host for its development; the larval stage lasts 10–11 days; the pupal stage of one of them 12–14 days. The eggs of *S. squalidus* are also destroyed by various predaceous insects such as *Aelothrips fasciata*, Hal. and *Haplothrips aculeata kurdjumovi*, Karny, subsp. nov. The author describes the larva of the latter

found by Kurdjumov on colonies of *Aphis crataegi*, Kalt., which they possibly also destroy. The egg stage of this predator lasts 5-6 days, its larval stage 22–25 days, propupa 1–2 days, and pupa 4-5 days, on the average. This Thrips pierces through all the eggs of the heap, thus arresting their further development, and then feeds on them, otherwise it would not be able to accomplish its development, as the eggs of the host hatch in 12–13 days. All these parasites together destroy some 64·4 per cent. of eggs of *S. squalidus*; a table showing the percentage infested by each of them during the investigations of 1913 is given; all of them attack also the eggs of *Eudipnus micans*.

The author then deals with remedies and first describes those applied by some fruit-growers in the government of Taurida. These consist of trenches, usually with straight walls, dug round the trees, or of conical heaps of earth round the trunks, covered with fine sand and surrounded by a trench. None of these obstacles seem very effective in preventing the beetles shaken off the trees from getting back to them. Other appliances are more fully described in the report of the Entomological Station of Kiev for 1912 [see this *Review*, Ser. A, i, pp. 397.] Shaking down the weevils on to sheets was also tried at the station of Poltava during the investigations in 1911 and the results obtained, as shown by two tables, although not conclusive, are considered useful. Picking out specimens of ladybirds which may get on the cloth, before destroying the insects shaken down, is suggested. The remedy most recommended is the use of belts of American tangle-foot. The author gives several tables relating to the experiments in 1912 and 1913, which all show the excellent results obtained by this method. An adhesive made from a recipe suggested by Mokrzecki is also very effective:—1 lb. of castor oil boiled with ½ lb. of resin; if correctly prepared this is as good as tangle-foot. The author agrees that adhesive belts serve rather to drive away the insects, as it is very seldom that beetles are caught by them. Should there be any fruit bushes or vines in the orchard, care must be taken to protect them from the beetles by means of trenches, and the insects must be collected from the trenches as well as from the bushes.

URICH (F. W.). **Description of a New Froghopper from British Guiana.**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, p. 43, 2 figs.

A new species of froghopper taken on grass and occasionally on sugar-cane in British Guiana is described under the name *Tomaspis flavilatera.*

SAVAGE (R. E.). **The Respiratory System of** *Monophlebus stebbingi*, var. *octocaudata.*—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 45-47, 5 pl.

A detailed description is given of the respiratory system of *Monophlebus stebbingi*, Green, var. *octocaudata*, Green, which differs from the majority of Coccids in having in addition to the meso- and metathoracic pairs, seven pairs of dorsal abdominal spiracles. This species is found on mango, jack fruit and species of *Ficus* in India, but as its life-history is comparatively long, it is rarely a pest; climatic conditions govern the production of large numbers of the individuals, so that outbreaks are irregular.

BALLARD (E.). **Two Pests of Mahogany in Nyasaland.**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 61-62.

The caterpillars of two moths, *Heteronygmia leucogyna* and *Mussidia albipartalis*, attack mahogany trees in Nyasaland, causing a large amount of damage every year; the former eats the leaves to the extent of defoliating whole plantations, while the latter bores under the bark, causing much deformity of young trees and the formation of corky excrescences, accompanied by the exudation of resin. The life-history of *Heteronygmia leucogyna* is as follows: The eggs are laid in batches of 150–200, low down on the trunk of the tree; the young larvae emerge at the end of nine days, and are pale yellow in colour, with bunches of fine hairs, and measure 3 mm. in length; the fully grown larvae may be pale or dark in colour, with dark heads, and are flattened; their length is 3 cm. The pupa is formed in a very slight cocoon consisting of a few threads, generally on the under side of a leaf or on an excrescence on the bark; the pupal period lasts for ten days. Both larvae and eggs of *H. leucogyna* are heavily parasitised; two species of CHALCIDIDAE and one Ichneumon, *Ecthromorpha variegata*, Brullé, have been bred from the larvae; in May and June nearly 90 per cent. of eggs collected were parasitised, but those found in September and October were unaffected.

The life-history of the bark-borer, *Mussidia albipartalis*, has not been fully worked out; the eggs, apparently laid on the trunk, give rise to larvae which at once bore into the bark; pupation occurs in a cocoon of tough white silk under the rough excrescences produced by the borings of the larva. The insect is parasitised by an Ichneumon and a Chalcid, but not to a sufficient degree to be an important check.

BITZKY (I. G.). **Отчетъ о дѣятельности Прибалтiйской станцiи по борьбѣ съ вредителями культурныхъ растенiй при Рижскомъ Центральномъ Сельско-Хозяйственномъ Обществѣ за 1913 годъ.** [Report on the work done at the Baltic Station against pests of cultivated plants by the Central Agricultural Society of Riga for 1913.]—*Wenden*, 1914, 28 pp.

This is the first yearly report of the Baltic Entomological Station in Wenden and it gives a short history of the organisation and establishment of the Station.

The following were the chief insect pests of field crops. Wireworms of the genus *Agriotes* occur over the whole country, damaging mostly summer-sown cereals and roots. *Apion apricans*, Hbst., is so abundant that it is nearly impossible to find heads of clover not infested by the larvae. Some 500 insects were reared from the cocoons and also two specimens of the Braconid parasite, *Eubazus macrocephalus*, Nees. *Apion violaceus*, Kirby, was also found on clover, but less frequently. Species of *Sitones* injured seedling peas and vetches. Species of *Phyllotreta*, in 1912, destroyed all the turnips, also injuring cabbage, linseed and beets. *Cassida nebulosa*, L., is not common, but is very injurious in some localities to beet-roots; in 1912 a whole field of beet was almost completely devoured by this pest, 5–10 beetles occupying every leaf.

There are no exact data showing that the larvae of *Euxoa segetum*, Schiff., have injured winter-sown cereals during the last two years, but it has been ascertained that these insects occur in the fields of potatoes, beet-roots and carrots. As many as twenty larvae were sometimes found underneath one root of beet; carrots were in some localities injured by them to such a degree that the injury was ascribed to hares; they were found also underneath onions. Species of *Cydia* (*Grapholita*) are spreading over the country to such a degree that the cultivation of peas has become impossible, up to 75 per cent. of the seed being injured by these caterpillars.

*Chlorops taeniopus*, Mg., was found in 1913 on barley in the fields of the Freidenstein School, 5 per cent. of the plants being injured by this fly. *Oscinis frit*, L., is frequently found.

With regard to orchards and market-gardens, the following pests are mentioned :—*Anthonomus pomorum*, L., together with *Cydia pomonella*, L., is very widespread and does great damage. *Rhynchites betuli*, F., is scarce. *Pieris brassicae*, L., and *P. rapae*, L., are abundant. *Aporia crataegi*, L., and *Vanessa polychloros*, L., are seldom found; *Hyponomeuta malinellus*, Z., occurs in large numbers in some localities and strips the apple trees. *Barathra* (*Mamestra*) *brassicae*, L., proves more injurious to cabbage than *Pieris brassicae*. *Nematus ventricosus*, Kl., is very injurious in some localities to gooseberries and currants. *Chortophila brassicae*, Bouch., is common.

The following insect pests of forests are reported :—*Rhyacionia* (*Evetria*) *resinella*, L., frequently on young pine trees; *Eucosma* (*Grapholita*) *tedella*, Clerk, on firs, especially young plants; *Lymantria monacha*, L., in large numbers in the forests of Kurland.

Dobrovliansky (V. V.). **Наблюденія надъ вредителями полеводства и садоводства, произведенныя Энтом. отдѣл. Кіевской станціи по борьбѣ съ вредителями растеній въ 1913 году.** [Observations on insect-pests of fields-crops and orchards, conducted by the Entomological Branch of the Kiev Station against pests of plants in 1913.]—**«Хозяйство»** [*Husbandry*], *Kiev*, no. 10, 27th March 1914, pp. 332-338.

This is a report of work on insect pests done during 1913 at the Station of Kiev by I. S. Ljubomudrov, who investigated the habits of various Microlepidoptera of the subfamilies Olethreutinae and Tortricinae; by I. F. Bay and D. I. Lessovoy, who dealt with the pests of grain crops; and by B. I. Belsky, who studied *Byturus tomentosus*, Bjerk.

*Recurvaria leucatella*, L., was found in spring shoots of apple trees, in a short longitudinal mine underneath the bud, causing all the leaves on the shoots to wither. Some of these shoots were cut off on the 19th May and put into water in the laboratory; the caterpillars grew slowly, remaining all the time inside the stem, and at the end of June pupated in their mines; the moths emerged on the 12th and 13th July. On the 9th July some small parasitic Hymenoptera issued from one shoot. The author remarks that this is the first time that caterpillars of *Recurvaria leucatella* have been found inside the stems, as, according to the usual statements, they live inside curled leaves; only the

caterpillars of *Laverna hellerella*, Dup,* and of *Recurvaria nanella*, Hb., have been previously reported to live inside shoots of apple and pear trees.

Olethreutinae and Tortricinae. In the spring of 1913 the leaves of apple trees in most of the orchards in the government of Kiev were damaged by various moths of these subfamilies, on some trees all the leaves being curled. The following species were studied:—*Tmetocera ocellana*, F., *Olethreutis variegana*, Hb., *Pandemis ribeana*, Hb., var. *cerasana*, Hb., and *P. heparana*, Schiff. The caterpillars of *T. ocellana* pupated on the 25th–28th May. Before pupating the caterpillars emerged from the curled leaves, in which they lived, and wove a white cocoon beneath the turned end of a fresh leaf; some pupated even on the walls of the box, or underneath the gauze covering it. Cocoons of these insects were found in the open on the 19th May. In the laboratory the moths emerged on the 11th and 12th June. The caterpillars of *Olethreutis variegana* were found on the 19th May, pupating on the 24th and 25th of that month in the same leaves which they had inhabited; the moths issued on 30th and 31st May. The caterpillars of *Pandemis ribeana* var. *cerasana* and of *P. heparana* pupated between the 23rd and 28th May, between two fresh leaves drawn together; the moths emerged on the 1st and 5th June. In the open the cocoons of these insects were found on the 19th May; on the same day a caterpillar was found with an egg of a Tachinid situated on the first segment of its thorax, on the upper side; this caterpillar pupated two days later and the fly issued in 12 days.

An attempt was made to trap *Euxoa* (*Agrotis*) *segetum* in troughs of molasses, which were placed on fallow land and in beet fields at the rate of four to the acre, but of the insects caught only 2 per cent. belonged to this species. Some digging conducted in August on one estate, where the caterpillars of *E. segetum* were injurious during the spring, resulted in the finding only of two pupae, both of which were parasitised by *Ambliteles vadatorius*, Ill. Only a few moths of the second generation appeared owing to the large number of parasitised larvae. The first eggs of the second generation were found on the 3rd September.

*Byturus tomentosus*, F., is a serious pest of raspberries; this beetle hibernates in Western Europe in the pupal stage, but in the governments of Moscow and Kiev it winters as an imago.

*Psylliodes picina*, Marsh., did great damage in spring to summer and winter-sown cereals on one estate; and were also found in August on trap crops of barley. At night and in cloudy weather the beetles remained in the earth, but in fine weather, in the day time, they fed on the leaves of the grain. Between the 31st August and 6th September copulating pairs were noticed. In the first half of October the beetles buried themselves in the earth to a depth of about an inch. This is the first time that this insect has been recorded as a pest of grain.

*Mayetiola* (*Cecidomyia*) *destructor*, Say, was found on the 28th June in a wheat field on one estate in the pupal stage, 10 per cent. of the plants being attacked. On the 1st September small numbers of the larvae were discovered there in seedlings of volunteer wheat.

---

*[Mr. J. H. Durrant suggests that the species intended is probably *Laverna atra*, Hw., the larvae of which live in apple shoots in spring; the larvae of *L. hellerella*, on the contrary, feed in hawthorn berries in autumn. —Ed.]

*Oscinella* (*Oscinis*) *frit*, L., was found in very large numbers on one estate; on the 3rd July a trap crop of barley was sown, and in August it was found that 90–100 per cent. of the plants were infested. Preventive measures consisted in reploughing the trap fields and ploughing in the germinating fallen grain; and these proved very effective, an infestation of only 6 per cent. being found in the winter-sown crops. About 14–15 per cent. of the pupae were infected with parasites. On another estate 30 per cent. of the young volunteer wheat was attacked and 15 per cent. of the winter crop.

CHILDS (L.). **The Anatomy of the Diaspinine Scale-Insect,** *Epidiaspis piricola*, **Del Guer.**—*Ann. Entom. Soc. America, Columbus*, vii, no. 1, Mar. 1914, pp. 47-57, 3 pl.

An account of the anatomy of the Italian pear scale.

GILLETTE (C. P.). **Some** *Pemphiginae* **attacking Species of** *Populus* **in Colorado.**—*Ann. Entom. Soc. America, Columbus*, vii, no. 1, Mar. 1914, pp. 61-69, 1 pl.

The following Aphids of this subfamily which attack poplars in Colorado are described:—*Thecabius populiconduplifolius*, *Asiphum sacculi*, sp. n., and *Mordwilkoja vagabunda*.

HOWARD (L. O.). **Report on Parasites.**—*Ann. Entom. Soc. America, Columbus*, vii, no. 1, Mar. 1914, pp. 86-89.

The report gives an account of the results of disseminating the parasites of the gipsy moth and the brown-tail moth in the infested areas during the past year. Owing to the fact that one of the imported egg-parasites of the gipsy moth, *Anastatus bifasciatus*, breeds very slowly, extensive collections were made during last winter of parasitised gipsy moth egg-clusters from colonies planted in previous years. From this material it was possible to liberate 1,500,000 parasites; these were placed in 1,500 colonies in sections where the insect had not become established. Colonies of *Anastatus* planted a year ago proved to be successful, although the spread was slow. Another egg-parasite of the gipsy moth, *Schedius kuvanae*, has become perfectly established in several places where it had been planted; its numbers had increased and in some cases it had spread nearly a mile and a half beyond the limits of last year's area. The Tachinid *Compsilura concinnata* was abundant in the summer of 1912. *Limnerium disparidis* and *Apanteles* sp., received from Europe, survived the winter and are established; in the case of the latter species, 7 per cent. of parasitism of gipsy moth larvae was found; *Limnerium* has so far shown no marked ability to increase. Another species of *Apanteles*, namely *A. lacteicolor*, an important parasite of the brown-tail moth, has been recovered in large numbers and has been found to attack gipsy moth caterpillars in widely separated regions. The *Calosoma* beetle (*C. sycophanta*) has been observed in large numbers where bad colonies of the gipsy moth were present; the good done by the beetle, which feeds upon the pupae as well as upon the larvae, is considerable. *Monodontomerus aereus* was found to have spread over practically the entire territory known to be infested by the brown-tail moth; *Ptero-*

*malus egregius* occurs over the same area, its numbers being on the increase.

Collins (C. F.). **The Peach and its Culture.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 3, March 1914, pp. 144-149.

The author states that the peach worm or twig borer (*Anarsia lineatella*), which is one of the most serious insect pests of the peach in California, is best controlled by spring spraying with lime-sulphur. Mention is also made of the almond mite which often attacks trees in the interior valleys during early summer. These are effectively controlled by dusting the trees with flowers of sulphur, which should be used as soon as the mites appear, with a hand-operated sulphur machine from a wagon, in order to reach the tops of the trees where the mites are most numerous. One man with a steady team should easily cover 400 fully-grown trees in ten hours.

Coole (A. J.). **Idaho Quarantines against California.**—*Mthly. Bull. Sta. Commis. Hortic., Sacramento, Cal.*, iii, no. 3, March 1914, p. 156.

The importation into the State of Idaho of potatoes from California has been prohibited, on account of the prevalence in the latter State of the potato tuber moth (*Phthorimaea operculella*). Idaho has also placed an embargo on all shipments of nursery stock from 21 Californian counties, because of the ravages of the pear thrips (*Euthrips piri*) in their orchards. While recognising the necessity of keeping orchards free from pests, the author's investigations lead him to think that this embargo is unnecessary, as it is doubtful if the insects are in the soil in the nurseries. Should they be in the ground where young trees are grown, the thorough washing of the roots would undoubtedly remove all danger.

Borodin (D.). **О мѣрахъ борьбы съ проволочнымъ червемъ.** [Measures against Elaterid larvae.]—**«Хуторянинъ»** [*Chutorianin*], *Poltava*, no. 12, 2nd April 1914, p. 382.

The author states that the best remedies for Elaterid larvae are various baits, poisoned or otherwise, consisting of slices of potatoes, carrots, beets, oil cakes, cabbage stalks, etc., which are buried in the earth at a depth of 3–4 inches in various parts of the fields. These baits are poisoned by adding to them either Paris green or arsenic, in which case they need no further attention; in case of unpoisoned baits they must be inspected practically every week and the larvae found on them destroyed with boiling water. He also recommends maize baits, prepared as follows:—About $\frac{1}{4}$ lb. of white arsenic and $2\frac{1}{2}$ lb. of maize well boiled in about $2\frac{1}{2}$ gallons of water, care being taken not to inhale the vapour.

The baits can be best used in autumn and spring, before sowing, or even afterwards, so long as the seedlings are not too high.

**The Narcissus Fly** (*Eumerus lunulatus*).—*Gardeners' Chron., London*, 28th March, 4th and 18th April 1914, pp. 223, 240 and 272.

Referring to the case of a narcissus bulb containing larvae of the small narcissus fly (*Eumerus lunulatus*) exhibited at a meeting of the Roy.

Hort. Soc. Scientific Committee, Mr. A. J. Bliss writes stating that, although more knowledge is wanted, evidence is strongly in favour of *E. lunulatus* being merely a scavenger, feeding on the excreta of *Merodon* grubs which inhabit the bulbs, or on decayed bulbs which have been attacked by fungoid diseases ; the facts that the larva can live on a variety of plants (rhizomes of iris, etc.), has no special food-plant, and has only done harm when *Merodon* or fungi have previously attacked the bulb, support the author's arguments. Mr. C. E. Shea, however, believes that the larvae are not hatched on the bulbs and he does not think that the larva is only a scavenger, since his own experience does not clearly demonstrate the relationship with *Merodon* or fungoid diseases.

Gorsky (P.). **Какъ уничтожить муравьевъ.** [How to destroy ants.] —**« Прогрессивное Садоводство и Огородничество »** [*Progressive Fruit-growing and Market-gardening,*] *St. Petersburg*, no. 13, 12th April 1914, pp. 403-404.

The author suggests the following remedies against ants :—Spraying over ant-hills and spots attacked by ants with powdered caustic lime gives good results ; if scattered round the trunks of trees it will prevent the ants from passing on to them, but the lime must be renewed from time to time. A lump of caustic lime placed inside an ant-hill will soon exterminate the insects if plenty of water is poured over the spot. Ant-hills may be treated with one-half to one pint of tar or kerosene in 3 gallons of boiling water. A solution of $\frac{3}{4}$ lb. of hyposulphite of soda in 5 pints of warm water is also useful and is harmless to the roots of trees, though on beds of plants a weaker solution must be applied and repeated in 1–2 weeks. In order to prevent ants getting on to trees, belts of cotton wool moistened with 20 per cent. carbolic acid may be used.

Vuillet (A.). **Utilisation de Certains Insectes Phytophages dans la Lutte contre les Ennemis des Plantes Cultivées.** [Utilisation of certain phytophagous insects in combating pests of cultivated plants.]—*Rèvue Scientifique, Paris*, 25th April 1914, pp. 526-530.

A general account is given of the usefulness of certain insects, themselves phytophagous, in combating pests of cultivated plants. They may be useful in acting as hosts for entomophagous species which prey upon the pest, such as *Siphonophora leptadeniae*, which harbours the parasites of *Aphis sorghi*, and *Barathra* (*Mamestra*) *brassicae*, which acts as a host for the parasite *Trichogramma semblidis* of the vine pest *Polychrosis botrana*. Another example given is *Alabama argillacea*, a casual pest on cotton, but which is nevertheless useful, provided it appears late, in suppressing indirectly the far more dreaded annual pest *Anthonomus grandis* by robbing it of its food supply.

Vuillet (A.). **Note synonymique sur le Thrips des Pois.** [Synonymy of the Pea Thrips.]—*Bull. Soc. Entom. France, Paris*, 1914, no. 5, pp. 161-162.

The pea thrips has been referred to by different writers as *Thrips*

*pisivora*, *T. physapus*, *Physapus robusta* and *Frankliniella robusta.* The author points out that all these names refer to a single species, and also that neither *Thrips* nor *Physapus* can stand as names for genera, so that the correct name is *F. robusta.*

LEONARDI (G.). **Contribuzione allo studio delle Cocciniglie dell'Eritrea (Africa orientale).** [A contribution to the study of the Coccids of Eritrea (East Africa).]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 27-38, 12 figs.

The author describes four new species of Coccids from Eritrea :—*Ceroplastes erithraeus* found on *Acacia*, *Saissetia cuneiformis* and *Lepidosaphes fiorii* on *Rhus aztechesan*, and *Pulvinaria dicrostachys* on *Dichrostachys nutans.*

LEONARDI (G.). **Nuove specie di Diaspiti viventi sull' Olivo.** [New species of Diaspinae living on the olive tree.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 66-71, 5 figs.

Two new Coccids, described by the author as *Aonidia oleae* and *Lepidosaphes olivina*, and a species of *Aspidiotus* were found on olive trees on the Eritrean tableland.

LEONARDI (G.). **Nuove specie di Cocciniglie raccolte in Italia.** [New species of Coccids collected in Italy.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 59-65, 5 figs.

The following three new species of Coccids collected in Italy are described : *Pseudococcus grassii* found on some bananas bought at Rome, *Aspidiotus viticola* on the vine and *Aonidiella inopinata* on the almond.

SZÉPLIGETI (Gy.). **Braconidae gesammelt von Prof. F. Silvestri in Africa.** [Braconids collected in Africa by Prof. F. Silvestri.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 101-104.

The following Braconids are described : *Bracon celer*, sp. n., from Cape Colony ; *Bracon lagosianus*, sp. n., *Pseudobracon nigripennis*, Szépligeti, *Pseudobracon silvestrii*, sp. n., *Pseudodoryotes camerunus*, Szép., and *Biphymaphorus pulchripennis*, sp. n., from Lagos ; *Disophrys lutea*, Brul., *Cremnops rufitarsis*, sp. n. and *Cremnops variabilis*, Szép., from French Guinea ; *Cardiochiles longiceps*, Rom., from Senegal ; *Biosteres caudatus*, sp. n., from Nigeria.

RAZZAUTI (A.). **Presenza e danni del** ***Pantomorus fulleri*** **in Italia.** [*Pantomorus fulleri*, its occurence and the injury caused by it in Italy.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 113-124, 7 figs.

Systematic notes, a full description of the various stages, the distribution and a bibliography of this Curculionid, known in the United States as Fuller's Rose Beetle, are given in this paper. First observed in the United States in 1879, the injury caused by *P. fulleri* has been of common occurrence since it is markedly omnivorous both in the

larval and adult stages. In the southern States, such as California, it lives in the open and seriously damages citrus plantations, while in colder regions, fruit and ornamental trees in the greenhouse are subject to its attack. The rose and geranium suffer severely and its other hosts include a great variety of garden plants, as well as almond and peach trees. Amongst species of *Citrus* it specially attacks *C. limonum* and to a less degree *C. aurantium* and *C. bergamina*, while *C. vulgaris* and *C. deliciosa* have not been touched. In 1913, trees growing in the open were attacked, though at Leghorn during recent years, citrus trees in pots, but not those in the open, have been infested. Both the small and the larger roots are attacked by the larva and the author has observed fungus spots on the surface of the injured roots. The plants look sickly, lose their leaves and finally wither. The imago feeds on the young buds and the mature leaves, which may be skeletonised in severe cases. *Pantomorus* further damages the young fruit by boring them at the point of attachment, thus causing them to wither. In Italy the beetles first appear towards the end of June, and being mostly nocturnal in habit, remain on the plant during the day. Oviposition takes place from the middle of August right through September. The eggs are laid in masses of 30 to 60. The larva, which hatches out in from 21 days to a month, at once burrows into the soil and attacks the young roots which are nearest the surface. In Italy the larval stage lasts until the end of the following spring, and the pupal stage from 20 to 30 days. *P. fulleri* seems to have been first observed in Italy in 1898, when it was found in Liguria, whence it is said to have been imported to Leghorn in 1908. In view of the extensive culture of Citrus in Sicily, it is to be hoped that its present circumscribed range may be maintained.

In the United States the natural enemies of *P. fulleri* are little known, but artificial methods of control, such as injections of carbon bisulphide, kerosene emulsion or tobacco extract, are stated to give good results. As the damage done in Leghorn is very slight, the author has not tried any of these remedies and has simply advised immersion of the plants in water for one or two days, which method has proved effective. Like most other Curculionids *P. fulleri* drops to the ground when touched, and by spreading a white sheet beneath the plant infested, the weevils are easily shaken off and collected. Subsequent banding of the trunk at a little distance from the ground will prevent a further infestation.

CECCONI (G.). **La *Grapholitha leplastriana*, Curtis, dannosa ai cavoli coltivati.** [*Cydia leplastriana*, Curtis, as a pest of cauliflowers.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 125-148, 1 pl.

Up to now the caterpillar of this moth was supposed to live exclusively on wild cabbages (*Brassica oleracea* var. *silvestris*, L.), but the author has discovered it in Italy on cauliflowers cultivated at Fano, in the Province of the Marche. The peasants there have known it as a pest for many years and on account of its ravages they now sow the seed after the 24th June instead of before, as was their former custom. In 1912, for instance, sowing was put off until about the 20th of July. In time, however, the insect has modified its habits

accordingly and late sowing is now no remedy. Two generations occur annually. The larva eats away the terminal bud, though even in years of severe infestation a large number of plants escape.

Control may be effected (1) by destroying the young plants which are infested; (2) by putting such plants in developing boxes in order to bring out and develop any possible parasites in the caterpillars; (3) by covering the beds of plants just above the ground with gauze, so as to prevent the moths from ovipositing on them. In this case some plants should be left as traps and such as become infested should be dealt with as under (1) and (2).

GRANDI (G.). **Descrizione di un nuovo Coccinellide africano,** *Serangium giffardi*, **sp. n.** [Description of a new African Coccinellid, *Serangium giffardi*, sp. n.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, 1914, pp. 165-178, 8 figs.

A description is given of *Serangium giffardi*, which was collected in Nigeria and in the Cameroons by Professor Filippo Silvestri. Both the adult beetle and its larva are actively predaceous on ALEURODIDAE.

RODZIANKO (V. N.). **О миндальномъ сѣмяѣдѣ, повреждающемъ сливы и абрикосы въ Астраханской губерніи.**—[On *Eurytoma amygdalis*, Enderlein, which injures plums and apricots in the govt. of Astrachan.] *Kiev*, 1913, 10 pp.

*Eurytoma amygdalis* was first described by Enderlein in 1907, when it was assumed to be a parasite, although the host was not known; it was obtained by K. Malkov in Bulgaria from mature seeds of almond, and nearly at the same time by J. F. Schreiner in the government of Astrachan, where its larvae damaged plums and apricots. The author refers also to some similar investigations on this insect by A. F. Fortunatov and by S. A. Mokrzecki in Astrachan.

The mature larva of *Eurytoma amygdalis* hibernates inside the stone of a plum or apricot, pupates there in spring and the imago emerges soon afterwards, having gnawed a hole in the walls of the stone and through the fruit. The female lays its egg inside the young fruits and the larva lives inside the stone, feeding on the unripened kernel; one larva lives inside one stone and usually destroys the whole kernel. The attacked fruits fall off either when still green or in a half matured state, though some are able to ripen and cannot be distinguished from healthy fruits. The author believes that this is due to the long period over which the females oviposit; if the egg has been laid early, the larva is able to destroy the kernel, thus causing the fruit to fall prematurely; if the egg has been laid later the fruit may be able to ripen. This assumption requires confirmation.

One generation of the insects occurs during the summer. Schreiner assumes that the females lay the eggs in the parenchyma underneath the epidermis, but the author thinks that it may also be true that the female pierces with its ovipositor through the parenchyma and the walls of the stone, which are then still soft. The author describes the larva and pupa and corrects, by request of Günther Enderlein, an error in the description of the female by the latter; the annulus (of the antenna) is as broad as or slightly broader than long, *not* twice as long as broad, as stated in the description.

The falling off of the unripe fruits, which may also be due to other causes, in Astrachan commenced in 1911 at the beginning of July and continued throughout the month. The exit of the imago from collected stones began in the following spring, the first, a male, emerging on the 4th May, the last, a female, on the 14th May, the males appearing before the females. In November 1913, the author opened some stones of plums obtained in Astrachan in August 1911 and inside many of them he found living larvae of *E. amygdalis*, which had thus survived three winters. It is thought that even in nature some larvae only pupate after the lapse of two or even three years.

The damage done in Astrachan is considerable. As remedies, the collection and destruction of prematurely fallen fruits and the prevention of oviposition, are recommended. The first remedy alone cannot be considered adequate as the larvae sometimes inhabit mature fruits.

RUBY (J.). **La cochenille de l'olivier.** [The Coccid of the olive tree.] —*Rev. Agric. Vitic. Afr. Nord, Algiers*, xii, no. 95, 3rd Jan. 1914, pp. 11-12.

*Saissetia* (*Lecanium*) *oleae*, usually known in North Africa as the "pou" or "Khermès," abounds there in most olive groves and is also found on a number of cultivated plants, such as the rose-laurel. The female lays from 230 to 1,500 eggs, the average being about 840. Oviposition takes places in summer and lasts 7 to 8 days. The young begin to hatch out in about 20 days, but temperature is an important factor. Not only do the trees suffer through the loss of sap, but a sooty fungus develops on the sugary excretion produced by the Coccids. The author points out that this fungus is not positively injurious, since, if it is wiped away, the leaf appears green and healthy.

**Kainite a scopo insettifugo o insetticida.** [Kainit as an insectifuge or insecticide.]—*Riv. Agric., Parma*, xx, no. 9, 27th Feb. 1914, p. 143.

In reply to a correspondent it is stated that to be effective as an insectifuge or insecticide, kainit would require to be used in large quantities. As it contains a large percentage of salt, large quantities would do more harm than good in a kitchen-garden. Naphthalined lime, crude naphthalin in powder, or crude petroleum may be used. Of the first about 300 lb. is required per acre. The contents of one tin of crude petroleum may be soaked into about 550 lb. of chalk or superphosphate. Lupin seed is also considered to be an insecticide. It contains 5 per cent. of nitrogen, 7 per cent. of phosphoric anhydride and 1 per cent. of potash. Eight hundred and eighty pounds are required per acre and the seed must first be roasted in order to kill the germ. After the crops have been harvested in autumn the same amount of crude ammonia* may be used.

[* "Crud ammoniacale," here translated "crude ammonia," is the product of the evaporation of the crude ammoniacal liquor from gas manufacture, and necessarily contains much less nitrogen than properly prepared ammonium sulphate. It probably owes its insecticidal properties to the various crude tar products mixed with it. This method of preparation is wasteful and is now almost completely abandoned.—ED.]

KURDJUMOV (N. V.). **Яровая муха и Озимая муха.** [*Adia genitalis*, Schnabl, and *Leptohylemyia coarctata*, Fall.]—**« Труды Полтавской Сельско-Хозяйственной Опытной Станціи.»** [Studies from the Poltava Agricultural Experimental Station], no. 21, (Part IX of the Publications of the Branch of Agricultural Entomology), *Poltava*, 1914, 43 pp., 27 figs.

*Adia genitalis* has not been known previously as a pest and has been only recently described by the late Dr. I. Schnabl and Dr. H. Dziedziki. It is assumed that this fly is spread over the whole of Europe, accompanying the cultivation of wheat. It is distinguished from *Leptohylemyia coarctata* by the velvet-black colour of its body and parts of its wings. In 1913, the first specimen, a male, was caught in the fields on the 14th April, a date coinciding with the appearance of the seedlings of summer wheat. The number of insects in the fields increased after that date, reaching its maximum on the 1st–3rd May, after which they decreased, and after the 1st June no flies were left alive either in the fields or in the laboratory. It has not been established what food the flies take in the open ; in the laboratory they fed on sugar syrup. The eggs were found for the first time in the spring of 1912 ; they are laid behind the sheath of the leaf as is the case with *Oscinis frit*, but the structure of the shell and the size is different. It was only in 1913 that the identity of the eggs was established, when they were obtained in the laboratory. The author describes the egg and the process of oviposition, which has been twice observed in the insectarium. Examination of summer wheat in the fields has shown that sometimes the eggs are laid behind the leaf-stalks and that on some plants two eggs are deposited ; but only one larva can develop in one stalk. The duration of the egg stage depends on the temperature, a table showing the time of hatching at various temperatures in the thermostat, ranging from 10·4° C. to 25° C. is given, from which it appears that the period varied from 2 to 8 days ; a temperature of over 35° C. kills the eggs. In 1912, the first larva was found on wheat on the 30th May, and the last on the 28th June. In 1913, the first larvae were noticed on the 30th April and the last on the 27th June. The author gives a table showing the number of eggs, larvae in their various stages and puparia found in the open from the 14th May to the 24th June 1913. The larvae moult twice, passing through three stages, which are fully described. In 1913, the first puparium was found on 28th May ; it appears that about 75 per cent. of the larvae leave the plant and pupate in the earth at a depth of $1\frac{1}{2}$–2 inches ; the remainder pupate on the plants, where their puparia have been found. The insect winters in this stage, emerging as an imago only in April of the next year.

Having emerged from the egg, the larva bores its way through the pith of the stalk to the point where the upper leaf, then still rolled into a tube, is situated. From the point of entrance into the central leaf, it moves downwards cutting a spiral way, which has two or three full turns. Having reached the tillering point (knot) the larva gnaws through its summit, thus severing the connection between the central part of the stalk and the root. This part of the stalk remains inside the uninjured outer leaf. The object of this tunnel is apparently to guarantee a food supply for the larva during the later period of its

development. It has not been established whether the larva feeds during this earlier stage, but the author is inclined to doubt it. The central leaf withers three or four days after the larva has entered the stalk; the upper part, which projects from the sheath, finally drops off; the remainder becomes soft and flabby and furnishes the dead tissues on which the larva feeds. The larvae are also able to infest two stalks; when one of them is too weak to allow the larva to complete its development, it passes to another one. In some cases the larva was unable to get into the second stalk, the tissue having become tough, but it then proceeded to eat into the tillering knot till the stalk withered and fell off. When passing to other stalks the larvae feed on the live tissues of the latter. It is estimated that about 40 per cent. of the larvae damage two stalks in this way; it has never been observed that one larva could damage three stalks of the same plant. An experiment undertaken at the Station shows that the larvae do not pass from one plant to another.

It is only when the plants have been infested very early in their growth and when the larva damages the tillering knot, that the whole plant perishes; normally a plant is able to tiller and to recover. It is not considered that the damage done to winter wheat is considerable, as usually the larvae injure only the side-shoots, which give no ears in that case. With regard to summer wheat, special investigations have been conducted at the Station, the results of which are illustrated by tables, figures, etc. At the time when the larvae pass into the leaf tube the infested plants show a greater tillering, resulting in the formation of new stalks, which, however, do not develop properly; the length of the stalks and the weight of the material in them shows a decrease as compared with healthy plants. At the moment of earing, the diseased plants show a decrease in tillering and a still greater decrease in plants giving ears, while the weight of the material of the plants is also smaller At the time of ripening, the number of grains in the ears of diseased plants is 15·5 per cent less than that of healthy plants, and the absolute weight of the grains is 3·4 per cent. lower; the number of ears is also less, most of the diseased plants having one, or a maximum of two ears, but never three; further, the ripening of the grains of the diseased plants requires more time. The general result of these investigations is to show that *Adia genitalis* decreases the harvest of the diseased plants by 40 per cent. This fly injures summer and winter wheat, and sometimes rye, but does not injure oats or barley. An experiment conducted at the Station shows that the insects do not oviposit on either of the last-named plants. Rye ripens quicker than winter wheat, and at the moment when the flies appear it has already grown sufficiently to resist attack. The author gives several tables showing the infestation of winter and summer wheat during the last two years; late winter wheat (sown in September) is more injured than that sown early, the former beginning to tiller only in spring, while the latter has completed the tillering in the previous autumn. Early summer wheat was the most seriously injured grain. The author calculates that the damage done yearly by the insect in the government of Poltava may be put at over £200,000. It is spread over many parts of the government and must be considered a very serious pest. No parasites of *A. genitalis* have yet been discovered. Control measures must be directed against the puparia,

which are very sensitive and are killed by even slightly unfavourable conditions. Therefore it is assumed that reploughing in autumn of the soil on which summer wheat has been grown must prove effective, although this method does not fit in with local economic conditions. Early sowing of winter grain and late sowing of the summer crop would be very beneficial, but such sowings are proved to be less productive, and besides they are more injured by some other pests, such as *Oscinis frit*, *Mayetiola destructor*, Aphids, etc.

The second pest dealt with is *Leptohylemyia coarctata*, Fall., and a full review of the previous literature concerning this fly is given. The author first observed this pest in 1912, when two larvae were found in May on winter wheat. In 1913, the first larvae were discovered on rye on the 9th April, the rye having been sown on the 24th July 1912; the last larva was found on the 21st May. Experiments have shown that the larvae are able to move in the earth from one plant to another, in which case they eat into the stalk, sometimes damaging the tillering knot and thus causing the plant to perish. The puparia were found, in 1912, on the 5th May in the earth at a depth of 2–3½ inches, the duration of the pupal stage being over seven weeks. In 1913, the first imago on the Station hatched on 8th June, from some rye which had been sown in July 1912. The maximum emergence took place from the 20th to 22nd June and entirely ceased at the end of that month. The number of insects on the wing in the open increased till the beginning of July, and they confined themselves to summer wheat and to oats. Having dissected the ovaries of some flies, which are described and figured, the author came to the conclusion that no second summer generation of these flies is produced, as the sexual products were not mature by the end of July. A fungus disease, which spread at this time, killed all the flies in the laboratory, save one female, which however had an enlarged body from which it was assumed that its ovaries were beginning to fill with eggs. This female was dissected on the 15th September and mature eggs were found in its ovaries. Two eggs were found in the box in which it was kept, not deep in the earth, and they were quite similar to the eggs contained in the ovaries of the female. The author describes and figures the eggs, and shows reasons for believing that the egg is the wintering stage for this insect.

In the government of Poltava the damage done by this fly was not great, as shown by a table, but at the same time it proved very injurious elsewhere, and especially in the governments of Tambov and Voronezh. It injures mostly winter-sown crops, such as rye, barley, and wheat; as to summer crops, they are injured only when sown over badly infested winter crops. The author is inclined to agree with other observers that oviposition takes place preferably on bare fields.

Coming to the question of remedies, the author is of opinion that all the remedies suggested by those who considered erroneously that the flies have a summer generation must be excluded. The suggestion of Ormerod and Rostrup to dispense with fallow fields and with the early sowing of winter grain crops after the previous crop has been cleared is not applicable to either Russia, England or Scandinavia; and in any case further experiments are needed in order to arrive at the best possible combination. It is recommended to manure the winter-sown fields with nitrates after the thawing of the snow, when

the plants pass through their critical stage so far as this pest is concerned; to sow winter crops more closely in those years when outbreaks of the pests have occurred (Ormerod and Rostrup) and to sow rye instead of wheat (Rostrup). The author is of opinion that harrowing the fields in spring may be unfavourable to the development of the larvae, which at that moment emerge and move to the plants. Further investigations are necessary to show the decrease in the percentage of injured plants in fields where this remedy has been applied, as well as to find out the best time for sowing winter crops.

BORODIN (Dm.). **Дѣйствіе бактеріи де Эрелля на перелетную саранчу.** [On the influence of *Coccobacillus acridiorum*, d'Hérelle, on *Locusta* (*Pachytylus*) *migratoria*, L.] Reprint from **«Энтомологическій Вѣстникъ.»** [*Entomological Messenger*], *Kiev*, ii, no. 1, 1914, 31 pp.

In the summer of 1913, the author was in the government of Stavropol (North Caucasus) and made experiments in injecting cultures of d'Hérelle's *Coccobacillus acridiorum* into the abdominal cavity of the following Orthoptera :—*Locusta migratoria*, L., *Oedaleus nigrofasciatus*, De G., *Stauronotus maroccanus*, Thunb., *Arcyptera flavicosta*, Fisch., and *Tmetis muricatus*, Pall. (1) These injections were pathogenic for all these insects and brought about death in 83 hours. (2) The virulence had been increased by passing the infection through many series of *L. migratoria*. (3) The increase of the pathogenic strength of the culture was ascertained; in the first two series death resulted in 83 hours, while in the following series (up to the 14th) the time decreased to 6 hours. (4) All the insects do not die in the earlier series, some continue to live and may possibly acquire immunity. (5) Death results more or less quickly according to the conditions of the experiment (temperature and amount of culture injected). (6) If the injection is effected by the mouth, death results very slowly and all the insects do not die. (7) This shows that the bacteriological method of locust destruction should be avoided until the question has been more thoroughly studied. So far, the method of destruction by poisoned baits has no rival.

LEONARDI (G.). **Contributo alla conoscenza delle Cocciniglie dell'Africa occidentale e meridionale.** [A contribution to the knowledge of the Coccids of West and South Africa.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, viii, 1914, pp. 187-224, 33 figs.

In this paper the author deals with the Diaspids from the collection of Coccids made by Professor Filippo Silvestri during his African journey (1912–13). The following species are new :—*Diaspis newsteadi*, found on a plant of undetermined species; *Aspidiotus transvaalensis*, on the leaves of *Nerium oleander*; *Aonidia simplex*, on an undetermined plant; *Dinaspis distincta*, on the bark of an undetermined plant; *Dinaspis lounsburyi*, on two undetermined plants; all the above from Pretoria. *Diaspis tricuspidata* found on the bark of an undetermined plant in Nigeria; *Howardia silvestrii*, *Aspidiotus unguiculatus*, *Pseudaonidia ferox* var. *perspinosa*, *Chrysomphalus greeni*, *Dinaspis giffardi*, *Dinaspis pseudomorpha*, *Dinaspis silvestrii*

and *Ischnaspis silvestrii*, all from French Guinea and found on plants of undetermined species ; *Aonidiella chrysobalani* from Senegal, where it was found on *Chrysobalanus* ; *Hemichionaspis proxima* from Senegal (where it was found on the mango), Senegal and French Guinea (on the mango and *Anona*), Dakar (on *Calotropis procera*) and Lagos, Angola and Pretoria ; *Chrysomphalus affinis* from French Guinea (plant undetermined) and Pretoria (on *Nerium*) ; *Lepidosaphes marginalis* from Manou (plant undetermined).

Tupizin (V. I.). **Грибныя болѣзни и насѣкомыя, наблюдавшіяся въ 1913 г. на южномъ берегу Крыма и въ Балаклавскомъ районѣ.** [Fungus-diseases and insect-pests noticed in 1913 on the South Coast of the Crimea and in the region of Balaklava.]—**«Вѣстникъ Винодѣлія»** [*Herald of Viticulture*], *Odessa*, no. 4, April 1914, pp. 226-231.

*Otiorrhynchus tauricus*, the caterpillars of *Agrotis*, *Pseudococcus vitis* and *P. adonidum* (*longispinus*) are reported as the more serious pests of vine in 1913 ; they have not however appeared everywhere, but only in isolated localities of the above district.

*Otiorrhynchus tauricus* did the greatest injury on the Appanage-Estate " Ai-Danil," where the weevils appeared after the beginning of April. The beetles remained in the soil during the day, but in the evening they attacked the buds and young leaves of the vines. As remedies, the insects were collected in the day-time and during the evenings with the assistance of lanterns, and a spray of barium chloride was applied. The cost of the hand collections amounted to £76, and picking during the evening was found to be more profitable than in the day-time. This hand-picking proceeded till the end of July, the weevils being most numerous in April ; the total number collected was 370,000. While the young leaves were still tender, a 2 per cent. solution of barium chloride was used, later it was increased to 3 per cent. ; potato-molasses was added to the solution, in the proportion of 5–6 lb. to every 55 gallons. The cost of the spraying operations was £28 8*s*., and they were conducted over an area of 81 acres. On other estates these insects did not appear at all, or only in small numbers.

The caterpillars of *Agrotis* were noticed on one estate after the 17th April, but out of over 20 acres of vineyards on this estate, they appeared only on about one-third of an acre. They attacked mostly the vine known as " Pino-Shardone," on which 1,200 caterpillars were collected in one evening, also the varieties Kaberne, Aligote and Saperavi. The damage done by the caterpillars consisted in eating out the buds and in injuring the leaves on the young shoots The caterpillars fed only at night, remaining in the ground in the day-time ; they were observed mostly in vineyards on slaty soil and in those fitted with wooden instead of iron posts.

*Pseudococcus vitis* has appeared yearly during the last 18 years on the " Livadia " estate, the greatest damage having been done in 1898. The campaign conducted against this pest has however gradually diminished the amount of injury done by it and of late it has not caused any considerable reduction in the vintage. The remedies adopted were, smearing the attacked stocks with kerosene emulsion during the

summer, and dusting with a mixture of sulphur and lime in the proportion of 1 part of sulphur to 2 parts of lime.

Amongst the other insects are mentioned: *Phytoptus vitis*, *Cecidomyia oenophila*, *Haltica ampelophaga*, and the moths, *Antispila rivillei*, *Ino ampelophaga* and *Clysia ambiguella*. The last-named insect was found on the "Livadia" estate in very small numbers; it injured mostly those varieties of vine which have thicker clusters, such as Risling and Aligote, although found also on Tchaushe; less damage was done to red grades. Handpicking of the insect, during the blossoming and again during the time of ripening, was tried with some success. All the other named pests appeared in such negligible quantities that no remedies were used against them.

SACHAROV (N.). **Вредители горчицы и мѣры борьбы съ ними.** [Pests of mustard and methods of fighting them (preliminary observations).]—*Report of the Entomological Station of the Astrachan Society of Fruit-growing, Market-Gardening and Agriculture, Astrachan*, 1914, 42 pp., 5 pls.

The author starts with a review of the cultivation of mustard in the Government [see also this *Review*, Ser. A. i, pp. 536–537] which tends to show that, although this plant is very valuable to the agriculturist and specially able to withstand dry weather, the yield is very small, ranging up to only 400 lb. per acre. The author attributes this to droughts, to insufficient attention from cultivators, and to insect pests, the last factor being the most important. The Entomological Station of Astrachan has conducted investigations on pests of this plant during the past year, some preliminary results of which are here recorded.

The author divides the insect pests of mustard into four groups as follows:—(1) Insects eating the leaves: *Colaphus sophiae*, Schall., *Entomoscelis adonidis*, Pall., *Pieris daplidice*, L., *P. rapae*, L., *Plutella maculipennis*, Curt., *Plusia gamma*, L., *Athalia spinarum*, F., and various species of *Phyllotreta*. (2) Insects damaging the pods, of which only *Euergestis* (*Orobena*) *extimalis*, Sc. was recorded. (3) Insects feeding on the roots: Larvae of *Lixus ascanii* var. *albomarginatus*, Boh. (4) Sucking insects: *Eurydema ornatum*, L., *E. festivum*, L. var. *chloroticum*, Horv., *Poeciloscytus cognatus*, Fieb., *Carpocoris purpureipennis*, De G., *Codophila varia*, F., *Dolycoris baccarum*, L., and *Aphis brassicae*, L.

*Colaphus sophiae* is found in many governments of Russia, breeding generally on various species of winter cress, and the author found it in Astrachan on wild Cruciferae, and especially on mustard. The beetle winters as an imago in the soil or under leaves, stones etc. The eggs are laid in heaps on the leaves, mostly on their lower sides, but also on the stalks; they are slightly stuck together and each heap contains from five to twenty-five or more eggs. The egg stage lasts four days; the larval stage 18–21; the pupal, 10–12 days, the larva burrowing into the earth to a depth of about ½ inch. The principal damage is done by the larvae, which live in colonies and pass from one plant to another. The imagines do not fly readily and remain on the mustard until it has been cropped; they then pass to cruciferous weeds or vegetables. The beetles also do much harm to cabbages

early in spring, destroying the terminal buds. *Entomoscelis adonidis*, according to A. F. Schreider, injures mustard only in the government of Saratov, in the districts of Kamyshin and Zarytzin; it is seldom found in Astrachan, although the latter government is divided from the former only by the Volga.

*Pieris daplidice* is found all over Russia, Caucasia and Siberia, except in the far north. It winters in the pupal stage. The female oviposits on the early seedlings of mustard; the eggs are laid singly, always on the lower side of the leaves or on shaded parts of them, 3 to 5 or more eggs being deposited on each leaf. The egg stage lasts from 8 to 10 days, the larval stage 22 to 24, and the pupal 10 to 14 days. Three generations are produced during the summer. This species also occurs on cabbage in the governments of Saratov and Astrachan. The pupae are parasitised by *Chalcis flavipes*, there being only one parasite in each pupa. *Pteromalus puparum* also attacks the pupae, several dozens occurring in each. The caterpillars are parasitised by *Anilasta ebenina* (which is itself parasitised by a Chalcid) and by *Apanteles glomeratus*, L., 30 or 40 parasites developing in a single caterpillar. The eggs of this buterfly are also attacked by certain Chalcids, including *Trichogramma carpocapsae*, Ashm.

*Plutella* (*cruciferarum*) *maculipennis*, Curt., oviposits in the angles of the veins of the leaves, laying 5 to 7 eggs singly, at some distance apart. The caterpillars pupate on the plant, the cocoons being sometimes compact, sometimes thin and transparent. Three generations were noticed on mustard, the first one appearing in May, the second at the end of June, and the third in August; as these insects hibernate in their pupal stage, it is assumed that a fourth generation must also occur. The insect is not as yet a serious pest. Several parasites attack the larvae and pupae, but the author is able to record only one, *Segaritis latratus*, identified by N. R. Kokujev. This parasite develops in the caterpillars, pupating in a cocoon inside that of the host.

*Plusia gamma* sometimes destroys large numbers of mustard seedlings. The imago, egg, larva and pupa are described. The females are very prolific, 500 eggs being obtained from one in captivity. The egg stage lasted 6 days, the larval stage 27 days and the pupal stage 10 to 12 days, giving a total of 43 to 45 days; thus three generations may occur. It winters in either the pupal or imago stage. The author has obtained a parasite, *Zitomastix truncatellus*, Dalm., from the caterpillars, several hundreds parasitising one host. They are also attacked by other parasites and by a fungus.

*Athalia spinarum.* In addition to the information already given in this *Review* (Ser. A. i, p. 536) the following data may be noted: The egg stage lasts 6 to 7 days, the larval stage 22 days, and the pupal 11 to 16 days. Next to *Phyllotreta*, this sawfly is one of the most important pests of mustard.

The leaves of the mustard plants are sometimes damaged by caterpillars of *Phlyctaenodes sticticalis*, L., which, in 1912, destroyed not only the foliage, but also the pods and young stalks. The young leaves and the petals are also attacked by various blister-beetles, such as: *Mylabris 4-punctata*, L., *M. variabilis*, Pall., *M. impar*, Thunb., *M. 14-punctata*, Pall., *M. floralis*, Pall., *M. dejeani*, Gyl., *M. 10-punctata*, Oliv., *M. zebra*, Mars., *M. crocata*, Pall., *M. calida*, Pall., and *Epicauta erythrocephala*, Pall., which however, more than make

good this damage by the destruction of the egg-masses of locusts by their larvae.

As a protection against leaf-eating insects, the author recommends spraying the plants with Paris green in proportion of ½ lb. of green, 1 lb. of caustic lime, and 1 lb. of green soap in about 33 gallons of water. The spraying must be done immediately after the young seedlings appear, when 2 to 3 small leaves have formed, and must be repeated before the appearance of the blossoms. Rainy weather involves respraying and a third spraying must be performed after the formation of the first pods, or after the blossoming, if insects are very numerous. The cost of the spraying with Paris green is estimated at about 1*s*. per acre.

*Euergestis extimalis* injures turnip and radish, also other vegetables grown for seed and, as shown by last year's observations, pods of mustard. The moths appear on mustard at the beginning of June when the first pods are forming, and on these they oviposit, the eggs usually being laid on the surface of the pods or in the suture along the septum. One female in captivity laid 80 eggs, and on being dissected showed more eggs in its ovaries. The author describes all the stages of the insect, pupation taking place in the earth at a depth of about 1 inch. The larvae devour the seeds in the pods, and when full-grown, sometimes consume the walls of the pods also. These insects injure mustard chiefly in the district of Astrachan, but are not common elsewhere. It is assumed that three generations occur, the first and the last breeding evidently on cruciferous weeds or on vegetables grown for seed. The caterpillars hibernate in their cocoons, pupation taking place in spring. The following parasites have been observed :—*Limnerium albidum*, Gmel., a solitary parasite ; *Bracon* sp., of which 5 to 8 larvae live in one host ; *Apanteles* sp., which parasitises the adult caterpillars, the larvae of the Hymenopteron leaving the host and pupating on the plant ; *Blepharida vulgaris*, Fall., reared from the adult caterpillars ; and *Agathis* sp., a solitary parasite of the pupa. Spraying with various arsenical insecticides is suggested as a remedy to be applied at the time when 7 to 10 pods have been formed ; a small number of blossoms suffer from the insecticide, but these will recover ; when the blossoming is over the spraying must be repeated.

*Lixus ascani* var. *albomarginatus* is found sparingly on mustard near Zarev, injuring the roots and causing the stalks to break. Rotation of crops is the best remedy ; and wheat or millet should be sown in places where the pest has appeared, the fields being surrounded with trap strips of mustard, which must be destroyed by burning at the end of their blossoming when oviposition has already taken place. If the strips are impracticable, mixed sowings of wheat, millet or some other plants, and mustard must be tried, at least 2 or 3 lb. of mustard mixed with sand being sown broadcast. This will attract the pest and after the blossoming is over, must be dug out, root and all, and destroyed ; care must also be taken to destroy stray mustard plants which survive the winter, especially after a wet autumn. The author mentions that another unidentified species of *Lixus* also occurs on mustard.

The various sucking pests are then dealt with. *Eurydema ornatum* is found everywhere in Russia, injuring chiefly cabbages and other vegetables ; in the government of Astrachan it especially attacks

mustard. The author describes the imago, egg, larva and nymph. The eggs are laid on the lower side of leaves of mustard in a double row, each female laying not more than 12 eggs; several generations are produced during the summer. The habits of *Eurydema festivum* are quite similar.

*Carpocoris purpureipennis* appears on mustard at the time of blossoming, laying masses of 14–15 eggs at the end of the pods. All these bugs are parasitised by *Aphanarus* (*Telenomus*) *eurydemae* Vas., sp. nov., which is able to control them effectively. The activity of the parasite was at its height during the first half of August, about 70 per cent. of the eggs of the hosts being destroyed. This new species will be described by I. V. Vassiliev in the "Revue Russe d'Entomologie." It has a hyperparasite, *Encyrtus telenomicida*, but only small numbers of this species were obtained.

As a remedy against all these sucking insects, the author recommends spraying with quassia and green soap emulsions; in his experiments, these insecticides caused the death of 20–50 per cent. of the larvae. Kerosene emulsion is more troublesome to prepare and requires careful handling, as it is very apt to burn the plants. The spraying must be done during flowering and after it is over. He describes the mode of preparing the emulsions, and gives the cost of a vedro (2·7 gallons) as about 3*d*. for quassia, 2*d*. for kerosene and about 4*d*. for green soap emulsions.

The last insect dealt with is *Aphis brassicae*, which is not uncommon on mustard in the steppes. The following enemies of this insect occur in the government of Astrachan:—*Adonia variegata*, Goeze, *Coccinella 7-punctata*, L., *Syrphus pyrastri*, L., *Syrphus balteatus*, Dg., *Chrysopa perla*, L., and *Aphidius brassicae*, Motsch. (?). The same insecticides are recommended; the author points out that on mustard the lice are usually not protected by the leaves, as is the case on other plants, so that spraying becomes more effective.

The author mentions that the peasants complain also that mustard is damaged by what they call "cobweb," which, if it appears at the time of blossoming, may actually kill the plants. The author has not been able to investigate this question, nor to see the spider (?) which causes it; but according to P. I. Rastegaiev, this "cobweb" was noticed last June on mustard in the district of Zarev, but no damage was done owing to the rains, which swept away the web. A small spider could be seen at this time on mustard seedlings and generally on the steppes, where all the plants were entangled by its web; the spider appeared after strong easterly winds.

Stewart (J. P.). **The apple in Pennsylvania: varieties, planting and general care.**—*Pennsylvania State Agric. Expt. Sta. Bull.*, no. 128, Feb. 1914, 27 pp., 10 figs.

The majority of the ills of a bearing orchard can be controlled with lime-sulphur and lead arsenate applied in accordance with the following schedule. For most scale-insects, the lime-sulphur is applied during the dormant season at a density of 1·03 or more, which is obtained by diluting the best of the commercial concentrated solutions to 1 in 10, or by diluting the 1–2–1 home-made concentrate to about 1 in 8. This material can also be used against scale in summer, if thoroughly

applied at the strength indicated below for use on foliage. In the latter case 3 sprays are required for complete control, the first preferably being applied immediately after the young begin to emerge and the others following at intervals of about 10 days, or whenever additional young appear. For the ordinary foliage-sprays a density of about 1·008 (obtained by diluting to about 1 in 38 commercial, or 1 in 30 home-made) is best for lime-sulphur on apples or pears. The lead arsenate is used at the rate of 2 lb. of the paste, or 1 lb. of the powder, to 50 gals. of diluted spray and it is usually added to the lime-sulphur solution and applied at the same time. The experiments made seem to prove that when combined with the latter solution the tri-plumbic arsenate is the safest. With the combined spray just described, the proper times of application and the chief enemies controlled by them are as follows. (1) Spray when the blossoms are just showing pink, or slightly before, for apple or pear scab, canker worm and bud moth; this being specially needed where scab is bad or the weather is damp and cool; also very essential, with the addition of a tobacco extract or a similar spray as noted below, where aphids or red bugs are present. (2) The second spray may begin when the petals are two-thirds off, and it should be completed within 10 days thereafter; this is the most important single spray, and the calyx cups should be filled; for the codling moth, scab, curculio, and later species of red bug as noted below. (3) Third spray, about 2 weeks after No. 2, for codling moth, curculio, sooty blotch fungus, and scab; also useful against the apple maggot, when present. (4, 5 & 6) In orchards subject to attack by bitter rot or apple blotch, make three additional sprays—preferably with Bordeaux mixture (3–3–50)—at intervals of about 3 weeks, beginning 8 or 9 weeks after the fall of the petals. (7) For second brood of codling moth, late scab infections, or late summer caterpillars, use lime-sulphur or Bordeaux and lead arsenate as above, about 1st August. When the second and third applications have been thoroughly made, this one is usually unnecessary, though much depends on the locality and season.

FEYTAUD (J.) & BOS (L.). **Observations sur l'emploi des pièges-appâts contre Eudémis.** [Notes on the use of bait-traps against *Polychrosis botrana.*]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux,* xiii, nos. 2 & 3, Feb. & March 1914, pp. 30-34 and 45-50, 4 figs.

Instead of expensive glasses, unglazed flower pots were used. These were varnished inside to make them waterproof, had a capacity of about 13 oz., and were filled with about 12 oz. of a mixture of 19 parts of 10 per cent. solution of molasses in water and 1 part of wine lees. These were inspected every 4 days, when the quantity lost by evaporation was replaced and the moths were removed and killed. A boy of 15 could attend to 5,600 traps. About 60 to 120 pots per acre appear to give the best results compatible with economy. To renew the liquid automatically, a trial was made with pots fitted with bottles turned upside down at such a height that their lips were about 1 inch beneath the holes serving to suspend the pot. This is the principle adopted in drinking troughs for birds. Captures were more numerous with this type of trap owing to the rapid fermentation of the molasses solution within the bottle. This was due to the heat of the sun, and

wine lees were not required. The solution, however, was more speedily exhausted owing to the quick fermentation and the swinging of the apparatus in the wind. It would be worth while trying earthenware bottles and the fixing of the trap by binding it to the vine stake.

Heavy rain plays havoc with the traps by overfilling them, the moths already captured being thus released, and further the dilution and cooling of the liquid renders the traps useless when the moths resume flight after the rain. The authors remedied this by adopting covers (either strips of tarred millboard, cut and bent so as to produce a circular, slightly conical roof, or earthenware saucers used upside down) suspended at a height of 6 to 8 inches above the pots on the wires by which the latter hang. This system proved a great success, the number of moths captured being much greater than that in the uncovered pots. This was very marked in rainy weather or when the north or north-east winds were blowing, which are unfavourable to flight. The system has no disadvantages, it effects economy in liquid and makes for regularity and success in the catches. The authors specially insist on the necessity for the trapping to cease as soon as most of the eggs have been laid and long before the flight has come to an end. Otherwise many very useful insects are taken. In one case they found 628 Chrysopids captured after the traps had ceased to attract *Polychrosis*. These Chrysopids and their progeny could have destroyed about 235,000 *Polychrosis* caterpillars in August and September. The only efficacious method of preventing this trouble is to reverse the pots when they have served their purpose. The same arrangement of wires used to hang them can be used without any adjustment and is practically permanent.

FEYTAUD (J.). **L'Otiorhynque silloné** (*Otiorrhynchus sulcatus*) **dans l'île d'Oléron.** [*Otiorrynchus sulcatus* in the island of Oléron.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xiii, nos. 2 & 4, Feb. & April 1914, pp. 21-25, 53-55.

Among the natural enemies of *Otiorrhynchus sulcatus* may be mentioned toads, Carabid and Staphylinid beetles, and wasps of the genus *Cerceris*. The toad is a great enemy of the weevil, and the same may be said of *Carabus auratus* and *Cerceris arenaria*. *Ocypus olens*, the large black Staphylinid, is stated to be a destroyer of *Otiorrhynchus*. Little is known of internal parasites, but De Gaulle reports Braconids of the genus *Blacus* as living on the Curculionid, and authors state that individuals have been found with a small round hole from which a Tachinid larva has emerged. Bordeaux mixture, either plain or with nicotin or other substances mixed in, only appears to exercise a repellent action for a short time. Arsenicals and other insecticides also act only for brief periods. Immersion has given good results in Greece, but this method is not always practicable. Ploughing at the end of April or early in May is not efficacious, though poultry following the plough might destroy the larvae and pupae exposed by it. To attract the weevils away from vines a patch of lucerne should be intercalated, as these insects are very fond of it. Bisulphide of carbon is very efficient, but not always susceptible of application. The author advises the collection of the adult insects as the simplest method. They must be collected by hand at night

with the help of a lantern. By placing a few shelter-traps it will be easy to locate them in numbers. The 100-acre area of vineyards which this weevil has attacked in Oléron belongs to over 100 small proprietors and this method is specially suitable in this case. [See this *Review*, Ser. A. ii, p. 229.]

CORY (E. N.). **Entomological features of the year 1913, and some work undertaken for the control of injurious insects.**—*Rept. Maryland State Hortic. Soc., College Park,* xvi (1913), 1st March 1914, pp. 168-170.

Various crops have been damaged in Maryland in 1913, though the grain and cereal growers have suffered more heavily than others. The army worm (*Cirphis unipuncta*) did considerable damage in Kent and Talbot counties. Experiments in cutworm control showed that both poisoned bran and middlings mash (50 lb. of bran or middlings treated with ½ lb. Paris green, 1 gal. molasses, and enough water to form a crumbling mass) and cut clover sprayed with a solution of Paris green (½ lb. green to 50 gals. water), were effective, the latter retaining its powers longer. The serpentine leaf-miner (*Agromyza pusilla*) was abundant on white clover and is also a serious pest of alfalfa. Frequent cuttings will control it. The green June beetles (*Allorhina nitida*), commonly called June bugs, were reported as seriously injuring corn in the vicinity of Cumberland. The larva feeds and matures on very rich ground, particularly in old manure piles. Thorough cleaning up each autumn and autumn ploughing will be beneficial. The boxwood leaf-miner (*Monarthropalpus buxi*), heretofore only reported from one place in Rhode Island, was found injuring a hedge in the suburbs of Baltimore. Several methods of control were tried. The last spraying—with whale-oil soap and Black Leaf 40—has not been entirely successful, but promises well. The trumpet leaf-miner of the apple (*Tischeria malifoliella*) has increased for several years. This year about 10 per cent. of the leaves in the College orchard were damaged. The smaller leaf surface in August and September inevitably reduces the vitality of the tree just when it is passing into the dormant state. Cabbages were injured in the autumn by several species of caterpillars, particularly by the cabbage looper. By proper spraying at a late date, with lead arsenate, soap and water it is possible to increase the late cabbage crop by one-third. A small bark beetle (*Ips grandicollis*) did about £100 worth of damage to Koster Blue Spruces at one of the nurseries in the State. The beetles—which apparently came from a pile of pine mine-props near by—bored into the young trees, killing them in a short time. The white pine weevil (*Pissodes strobi*) is another pest found in a nursery on seedlings. It feeds in the tip of the leading shoot of the pine, stunting the growth and producing a misshapen tree.

PICARD (F.). **Les chélonies ou chenilles bourrues.** [*Arctia caja* or "woolly bears."]—*Progrès Agric. Vitic., Montpellier,* xxxi, no. 9, 1st March 1914, pp. 261-266, 1 pl.

The author has already published accounts of this pest [see this *Review*, Ser. A. i, p. 249]. The young caterpillars which hatch out

towards the end of the summer reach one-third or one-half of their growth by the time the cold season arrives and then hibernate until the spring. In Hérault they appear about the middle of March and begin devouring the shoots as soon as the latter develop. The critical period extends up to the middle, and sometimes to the end, of April, but even in the worst cases the damage is not as bad as that caused by the cutworms, because the woolly bears only eat the leaves without cutting off the shoots. Towards the end of April, a loose cocoon is spun and the moth emerges during May, living only a short time. The summer caterpillar hatches out at the end of June and spins its cocoon in August; it is of no importance to the vine-grower. Neither *Arctia villica* nor *Eucharia festiva* (*hebe*) are of anything like the importance of *A. caja.* They and *Diacrisia* (*Spilosoma*) *mendica* and *D. lubricipeda* may occasionally be found with *A. caja*, and also attain sometimes to numbers sufficient to warrant attention. Parasitic insects, bacteria and fungi all help to control the woolly bears, which, however, are shunned by most birds and carnivorous animals on account of their hairs. The destruction of the larvae caused by the Braconid *Apanteles* is second only to that due to the fungus *Empusa aulicae*; in 1913, perhaps one caterpillar in a hundred escaped. A coccobacillus, described by the author and G. R. Blanc [see this *Review*, Ser. A. i, p. 166] under the name of *Bacillus cajae*, helped to control the pest. According to their experiments *B. cajae* is able to kill a large number of other insects, especially by inoculation. Some woolly bears were also infected by ingestion, but with great difficulty. Insecticides are of no value in the case of this pest and collection by hand is the only practical method. It must be begun immediately the caterpillars appear and continued as long as possible.

Sicard (H.). **Sur la prétendue destruction des insectes parasites de la vigne par les gelées d'hiver.** [The supposed destruction of vine pests by frost.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 9, 1st March 1914, pp. 266-268.

The author gives the results of investigations in the centre of the districts which suffered most from recent severe frost, where he examined vines in which all the shoots were destroyed by it. *Haltica ampelophaga* were in perfect condition, and young Coccids were moving about beneath the bark, indeed the cold appears to have favoured them. The caterpillars of *Arctia caja* seemed quite vigorous; of 42 caterpillars collected, 33 were alive, 5 were parasitised by Hymenoptera, and only 4 were dead. The author states that some larvae of *Pentodon punctatus* were frozen together with the earth around them into a solid block of ice, but when the warm weather returned they resumed feeding. He concludes that the most serious vine pests have survived and will prove more than usually injurious as the cold has damaged a portion of their food supplies.

Molinas (E.). **La destruction des parasites du sol.** [The destruction of underground pests.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 12, 22nd March 1914, pp. 374-378.

An old method of clearing the soil is the burning of vegetable rubbish at the affected points. This must be undoubtedly efficacious and may

be resorted to where occasion offers and the cost is low. The use of formalin or potassium cyanide is condemned, for both are said to have a bad effect on the plants and, furthermore, the latter substance is too deadly a poison to be recommended in any case. Carbon bisulphide is a very useful substance [see this *Review*, Ser. A. ii, p. 255]. Potassium sulphocarbonate is produced commercially in the form of a dark red solution containing 14 to 16 per cent. of sulphide and 18 to 20 per cent. potash. Under the action of the carbonic acid contained in air and in water this chemical slowly decomposes and resolves itself into carbon bisulphide and sulphuretted hydrogen—both of which gases are insecticides—and a residue, potassium carbonate, which is a useful manure

Some years ago about 20,000 acres of vineyards were treated with potassium sulphocarbonate. Its cost prevented more extensive use, for much labour was required and a huge quantity of water had to be transported to the vineyards in order to saturate the soil infested by *Phylloxera*. This question of cost is of less importance in horticulture. As this chemical killed *Phylloxera*, which is so refractory to control, it is surprising that its use has not become general in dealing with pests usually found in the soil. Of its value as an insecticide there can be no doubt at all. The author made the following test personally : 1 part of the commercial solution was diluted in 100 parts of water, both by volume, and the liquid was poured from a watering can in such quantity as to ensure adequate penetration. In the case of tulips, the watering can was fitted with its rose, but this was removed when treating carnations, as the stream of liquid had to hit the soil exactly at the point where the stems emerged. Slugs, cut worms, earth worms, white grubs, Longicorn larvae, and millipedes were speedily killed. When digging out the tulips a fortnight later, a large number of slugs were found dead, thus conclusively proving the efficacy of the treatment. Potassium sulphocarbonate has the advantage over carbon bisulphide that it acts more slowly and for a longer time, and that it entirely impregnates the mass of soil on which it is poured. Those insects which are buried deep enough cannot escape to the surface, while those which can escape to the surface are easily killed. Any soil may be treated, the quantity of liquid being suitably varied, and application is very easy. Tulips and carnations are not affected by a 1 per cent. solution, even 2 per cent. may be used ; only when a 5 per cent. solution is employed do carnations begin to suffer. There is no object in increasing the strength beyond 2 per cent. Flowers are not injured if the liquid is spilled on them. The only essential condition is to saturate the soil right through to the depth of the pests buried deepest. Soundings are necessary to acquire certainty on this vital point. Where boxes are used, planting may be done after the earth contained in them has had time to dry after disinfection. Potassium sulphocarbonate solution costs about 32*s*. per cwt. and has a specific gravity of about 1·200. Its cost is, therefore, not very high and the manurial value of the potassium carbonate might also be deducted. Lastly it is one of the rare insecticides which are not extremely poisonous, while the products of its decomposition are harmless.

Thiébaut (V.). **Le Phylloxera et la reconstitution au Caucase.** [Phylloxera and vineyard reconstruction in the Caucasus.]—*Progrès Agric. Vitic., Montpellier,* xxxi, no. 12, 22nd March 1914, pp. 378-379.

Confined to the government of Koutais for some 20 years by the Souram Mountains, Phylloxera, which was discovered in the Souchkoum district in 1881 [see this *Review*, Ser. A, ii, p. 167] had limited its ravages to the destruction of the 100,000 acres of vineyards in that government. One quarter of this area has been replanted and there the vines are now flourishing, but unfortunately inferior grafts and stocks were planted, so that the wine produced is very poor. About 10 years ago Phylloxera passed over the Souram Mountains into the western portion of the government of Tiflis, where it appeared to have taken a hold. Although official agronomists reported it often in the great Kakhétien vineyard, proof is now forthcoming that it has been present nearly everywhere during the last 8 years. The most important vineyards of both the East and West Caucasus have been attacked and though it is not believed to have reached the vineyards of the Elisabetpol and Baku government, it is expected that shortly, not a single Caucasian vineyard will remain immune, and there will consequently be a dearth of good resistant stocks, as the latter have not been planted in the Caucasus.

Degrully (L.). **Les sels arsenicaux en agriculture.** [Arsenicals used in agriculture.]—*Progrès Agric. Vitic., Montpellier,* xxxi, no. 12, 22nd March 1914, pp. 356-357.

On the 3rd March the Académie de Médecine concluded the discussion of the proposals embodied in M. Lucet's report. The following resolution was adopted :—" A decree of the Minister of Agriculture, published after consultation with the Superior Council of Public Health of France, shall determine the precautions which must be observed by users of arsenicals. Soluble arsenicals may only be sold after being denatured." The following rider was added :—" The Academy, in view of the fact that all arsenicals are extremely poisonous, expresses the wish, (1) that where the public authorities authorise their use the rules relating to such use be minutely specified, fully brought to public notice and supervised in their application ; (2) that the Government promote and encourage research tending to replace arsenicals by other less dangerous products."

Blaschke (P.). **Die Raupen Europas mit ihren Futterpflanzen.** [The caterpillars of Europe with their food-plants.]—*Annaberg,* 1914, pt. i, pp. xxix and 264, 6 pls. ; pt. ii, p. 75, 28 pls.

The introduction to this work consists of a brief description of caterpillars and pupae in general, followed by directions for their collection and rearing, with some short notes on the fungus diseases to which they are liable.

Part I is entitled " Raupenkalender " and consists of a description of European caterpillars with their food-plants arranged by months, and on the 6 coloured plates 156 species are figured. The calendar extends from February to November, and under the scientific name

of each insect is given its German popular name, its distribution, the number of generations per annum, a brief description, a list of food-plants, the character and resting place of the pupa, the subsequent months in which the caterpillars are to be found and the dates of succeeding generations, a brief description of the egg, and a note as to any peculiar habit of the caterpillar. This part of the work occupies 209 pages, and is followed by an index of the most common popular names of the insect and caterpillar in German, and a second index of 34 pages under specific names with a reference to the food-plants.

The second part contains a brief description of the food-plants arranged in alphabetical order, with their German popular names, and under each a list of the caterpillars which feed upon them, the month in which they are to be found on the plant being indicated in each case by figures. This is followed by an index of German plant names, and 28 coloured plates, figuring 112 different food-plants.

Although this book is not primarily intended for the economic entomologist and embraces a very large number of species which have not yet been placed upon the list of pests, it forms, nevertheless, an exceedingly valuable work of reference on the subject, and the author has rendered no small service to economic entomology by making it possible, through indices of this kind, to trace any of the caterpillars referred to, either under their scientific or popular names, and to lay hands at once upon information as to its distribution, food-plants and general habits.

A similar book dealing with other orders of insects, and especially those which are injurious to crops, would be of the greatest possible assistance to economic entomologists, and would save a large amount of time and labour. There is great need of a reliable polyglot index of popular names, not only of insects but of plants, as there seems to be no reasonable probability of the abandonment of their use. The frequent neglect of authors to give the scientific name of the insect whose depredations they are describing, is a cause of doubt and often of error, and this book will help to remove at least some of these difficulties so far as the German language is concerned.

Ossipov (N.). **Отдѣлъ изъ годоваго отчета о дѣятельности инструктора-энтомолога.**—[A portion of the yearly report of the Entomologist-Instructor (of the Govt. of Bessarabia).]—**« Садоводъ »** [*Horticulturist*], *Rostov-on-Don*, no. 3, March 1914, pp. 250-254, and no. 4, April, pp. 343-349.

The author, who is the Entomologist to the government of Bessarabia, has been deputed by the Zemstvo to organise specimen orchards in various parts of the government in which to exhibit all the remedies and operations recommended by the Station for combating pests. In this part of his report he deals with his work on pests of orchards and vineyards.

Twenty-seven such specimen orchards have been established in the districts of Chotin, Benderi and Kishinev, in which the peasants depend mainly for their livelihood on the yield of their fruit trees. The author usually selected for the purpose some peasant's orchard which was situated along a high road, so that all the passers-by could see what was being done. In some villages these orchards belonged

to and were organised by the School, Zemstvo, Hospital, etc. The work consisted in spraying with various fungicides and insecticides and the author used to advertise this beforehand in the village and to invite all those desiring to attend; he demonstrated the preparation and use of the poison, the mode of spraying, etc.; these demonstrations were occasionally accompanied by lectures. The peasants were later able to satisfy themselves as to the improved state of the specimen orchards and showed themselves more willing to apply the same remedies in their own.

The chief orchard pest in Bukovina (in the district of Chotin) is *Aspidiotus ostreaeformis*, Curtis. In recent years there have also been outbreaks of *Aporia crataegi*, the caterpillars of which in 1913 stripped the leaves of 50 per cent. of the orchards, though about 40 per cent. of the caterpillars failed to pupate, having been attacked by a Braconid parasite. Most of the peasants destroy the nests of *A. crataegi*, but some of them hesitate to do this owing to religious scruples, and even when collecting the nests do not destroy them, but throw them out on the road or into ditches, which does not prevent their further development. Besides these pests *Sciaphobus squalidus*, *Anthonomus pomorum*, *Rhynchites pauxillus*, *Lymantria dispar*, *Psylla mali*, *Psylla pyri*, *Hyponomeuta malinellus*, *Aphis mali*, etc., also occur. In some parts of the district of Kishinev, where the chief crop is plums, the trees suffer most from a Coccid and from *Cydia* (*Grapholita*) *funebrana*, etc. In the orchard district of Benderi, an unidentified green caterpillar has done considerable damage to plum and pear trees. There also occurred *Hyponomeuta malinellus* and *Sciaphobus squalidus*, against which spraying with Paris green (1 oz. of green and double this amount of slaked lime in 9 gallons of water) or with Djipsin (1–1½ oz. in 5½ gallons of water), and hand-picking were applied. As a preventive remedy for the future, the author recommends the removal of the supporting posts and pouring boiling water over the vinestocks early in spring, which will destroy the caterpillars wintering underneath the bark. Other pests of vine noticed were *Lethrus cephalotes* and *Melolontha*, the larvae of which have injured the roots in many localities, and in some vineyards they have destroyed the young stocks. Potatoes planted afterwards on this ground were also destroyed by the larvae and by *Amphimallus solstitialis;* little damage, however, was done to sets, which subsequently recovered.

The author gives a list of pests noticed in various parts of the government and the dates of their occurrence.

Korolkov (D. M.). **Вредители Сада.** [Pests of orchards.]—**«Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи.»** [*Materials for study of the injurious insects of the Govt. of Moscow,*] *Moscow*, v, 1914, pp. 1-93.

This is a report on various insect pests investigated by the author in an experimental orchard leased by the Zemstvo specially for this purpose.

*Aporia crataegi*, L. It has been observed that a great many caterpillars of this butterfly perish during the winter, and the author is inclined to ascribe this chiefly to the influence of cold. The caterpillars started emerging from their nests after the middle of April,

but returned to them at night or during the colder parts of the day. They attacked the buds of apple trees and in some orchards they have destroyed all the buds on some trees. The hopes that the damage done by these pests would be less than usual, owing to the great number of caterpillars killed by the cold, were not realised. Pupation began on the 29th May and the butterflies appeared after the 6th June; oviposition began in the second half of July. The author deals at great length with the destruction of the winter nests of these pests, which has hitherto been the chief remedy used.

*Anthomomus pomorum*, L. The hibernating weevils appeared on 4th–6th April; adult larvae were found about 23rd May, and pupae about the 28th. The methods adopted for eradicating the weevils were:—(1) cleansing the bark of the trees at the end of March, (2) shaking the beetles from the trees, and (3) trap belts. The author describes a special cloth funnel prepared by him for collecting the pieces of bark and the beetles scraped off the trees. The number of beetles collected varies according to the temperature of the day and the date of the operation; the nature of the bark also has an effect, fewer insects being found on trees with smooth bark, the beetles then keeping nearer to the foot of the tree. Shaking on to sheets should be begun in the first warm days of the season, as soon as the beetles emerge from their wintering places and proceed to spread over the trees; the method adopted is fully described. The author estimates that the cost of shaking amounts to about 1d. per tree; he compares the cost of this remedy with that of spraying with milk of lime, which he considers to be a more complicated and costly method. He mentions that a few trees were sprayed with carbolic emulsion against eggs of *Psylla*, but this did not drive away the *Anthonomus*. Trap belts are recommended to be put on the trees at the end of summer and to be taken down in the following spring; in which case they appear very useful, as the insects seek protection beneath them from the cold and can be collected in great numbers.

*Psylla mali*, Schdb. The first larvae issued from the hibernating eggs at about the middle of April, immediately proceeding to the buds. The cold weather, with snow, which set in at about the end of April, had no marked influence on them, except those which were preparing to moult. By the middle of May most of the nymphs had concentrated on the petioles of the leaves of apple trees, and the insects started flying at the end of May. A partial second generation was observed. The measures applied against the eggs were spraying with sulphate of iron, carbolic emulsion and milk of lime; against the larvae, spraying with soft soap, tobacco extract, combined mixtures, and carbolic emulsion. It appears that milk of lime had no effect on the eggs. Although the experiments with carbolic emulsion are not conclusive, owing to the small number of trees sprayed, it is believed to affect the development of the embryo if a 1 per cent. emulsion is sprayed on the eggs a week before hatching. Two tables show the results. In spraying with iron sulphate, the solution recommended is ¾ lb. of sulphate in 2 gallons of water, if flour paste is added, but the strength must be doubled if no paste is used; one spring spraying is not sufficient to destroy all the eggs. For spraying the larvae the author concludes that the best insecticides are tobacco extract and soft soap; they kill the insects quickly and are harmless to the plants;

their only disadvantage is the cost, which is comparatively high. Kerosene emulsion deserves attention as a less expensive insecticide, although it requires careful handling and preparation. The results obtained with 1 per cent. carbolic emulsion are considered satisfactory; this preparation does not destroy the larvae so quickly as tobacco extract or soft soap, but it diminishes their activity to a great degree; early in spring this remedy can be applied first against the eggs and then against the larvae. Taking average prices, the cost of spraying eggs or larvae of *Psylla* with carbolic emulsion is about 3d. per tree for double spraying; the cost of iron sulphate is about the same; while the cost of spraying with tobacco extract or soft soap is about 7½d. per tree. Fumigating the imago of *Psylla* with tobacco dust is considered an effective remedy, provided it is applied by all the fruit-growers of the district at the same time.

The author summarises his observations on *Anthonomus pomorum* and *Psylla mali*, which are the chief pests of orchards in the government, and points out that the average cost of combating them must be put at about 7½d. per tree; this figure, although very moderate, represents however, the average income which a grower may now expect from his apple tree. At the same time, if the remedies were applied by all growers, the yield of each tree could no doubt be increased

*Byturus tomentosus*, F. In 1913, the hibernating beetles did not emerge till the latter half of May, and remained a longer time than usual on cherry and plum trees, owing to the failure of apple trees to produce blossoms. The amount of damage done by these insects to cherry trees was not capable of estimation, owing to the cold weather, which affected the buds, and to the presence of *Argyresthia ephippella*, F. After the blossoming of cherry trees, the beetles usually pass to raspberry bushes, but in those places where there were blossoming apple trees, they attacked the blossoms of the latter. The author mentions that he has found 19 beetles on one apple-blossom. As a rule these beetles prefer blossoms to unfolded leaves, as their principal food consists of the stamens, styles and nectaries. The beetles were also found on strawberry blossoms. Oviposition took place on raspberry bushes, which started blossoming on the 5th to 7th June; on the 20th June larvae could be found in the blossoms. The ripening of the raspberries began about 17th July, at which time a larva could be found in every berry. This first brood of larvae pupated in the middle of August and on 21st–23rd August a second brood of beetles appeared. The investigation showed that as a rule the beetles winter near the bushes, not further than about 1½ feet from the main stem. They pupate in the soil, and it is essential for their development that this should be friable and slightly moist. The experiments to test the ability of the beetles to live without food have shown that they perish after more than two weeks of starvation. The damage done by the pests in both their larval and imago stage consists in injuring the buds, stamens, pistils, and nectaries, and in piercing through the thalamus of the fruit. The damage to the nectaries considerably decreases the weight of the fruit, and the percentage of waste is higher in the case of raspberries with injured fruits.

The author has tried the effect of slacked lime on the beetles and their larvae by putting powdered, freshly slacked lime into the earth underneath the bushes and watering it later; these bushes gave good

fruit and the latter were able to ripen before the larvae had grown up sufficiently to injure them. Some bushes of raspberries were covered early in spring with gauze, in connection with some observations on *Incurvaria rubiella*, Bjerk., and these fruits were also not damaged by the beetles and larvae of *B. tomentosus*. In the same way the fruits which were protected from *B. tomentosus* by spraying with Paris green were also able to develop and their nectaries showed no signs of injury. Carbon bisulphide was injected into the soil and gave excellent results in spring, but less favourable in autumn, when evidently the excessive moisture of the soil, and perhaps also the cold, decreased the effect of the poison ; the cost of this remedy is about ½d. per bush. Wood ashes had no effect on the beetles. An attempt to drive away the beetles from the bushes by means of carbonic acid, carbon bisulphide and tobacco proved quite ineffective. Shaking the beetles into specially constructed funnels proved a useful remedy against this pest, as well as against other insects which may attack the plants. Spraying with Paris green is not recommended. The careful and timely picking of the ripe raspberries, accompanied by the removal of the damaged ones, is considered to be a valuable remedy ; the collected fruits must be taken away from the gardens at once so as to prevent the larvae from getting into the friable soil under the bushes for pupation, which is the most favourable ground for this process.

*Cydia* (*Carpocapsa*) *pomonella*, L. Owing to the total failure of the apple crops, these insects oviposited on *Crataegus* and cherries ; in many places the damage to the latter was very noticeable. The caterpillars of *Hyponomeuta malinellus*, Z., appeared about 23rd April ; pupation took place from the 6th July. An Ichneumonid similar to *Holocremnus clandestinus*, Holmgr., was reared from the pupae. Early in spring the larvae of *Argyresthia ephippella*, F., feed on buds about to open ; the leaves and blossoms are then entangled with a web, the larvae feeding on the young leaves. Later they eat away the stamens, stigmas, styles and ovaries of the blossoms. Pupation begins in the middle of May, the imago issuing in the first half of August. The eggs were found on cherry leaves in groups, covered by web.

*Incurvaria rubiella*, Bjerk. On 16th April, 12 bushes of raspberries were sprayed with the following mixtures, about 2 lb. of caustic lime, which was slaked before use, and 1 oz. of Paris green in 4½ gallons of water ; the mixture adhered so firmly to the plant that the rain which fell the next day could not wash it off. The results of the spraying were very satisfactory and only one bud on one of the bushes was found on 16th May to be infested by a larva of this moth, while on some bushes left purposely unsprayed, half the buds contained 1 to 3 larvae. A parasitic fly, not identified, was reared from one pupa ; a Chalcid parasite (*Pteromalus*) was also obtained. The larvae were also noticed in the young raspberries. They get underneath the loose bark of raspberry bushes near the bottom of the stem, not higher than 7 inches from the ground, and there they build cocoons and hibernate.

*Zophodia convolutella*, Hb. It has been observed that the tiny caterpillars eat into the fruits of gooseberry and currant, and only the change in colour of the fruit, which turns from green to a dark or red colour, indicates the presence of the larvae. In the autumn of 1913, fungus disease was observed on the larvae, which wintered underneath gooseberry bushes. The report mentions also the following pests :—

Two generations of *Eriocampa adumbrata*, Klug, and *Nematus ventricosus*, L., were observed on gooseberries and currants. *Aphis idaei*, Goot., was found on raspberries, the branches attacked by the lice producing no fruits; *Myzus ribis*, L., on leaves of black currants; *Rhopalosiphum ribis*, Koch., on leaves of red currants; *Scopelosoma satellitia*, L., was found on raspberries and apples, the caterpillars being very voraciou . The eggs of *Rhynchites auratus*, Scop., were found in cherries on 26th June, the larvae being full-grown by 5th August. *Phyllobius* injured mostly leaves and blossoms of cherries, but were also found on apples, pears, plums and raspberries, the most common species being *P. piri*, L. *Anthonomus rubi*, Hbst., is injuring the buds of raspberries to an increasing extent. The following enemies of *Psylla* were noticed: Syrphid larvae destroyed the larvae and nymphs; *Anthocoris nemorum*, L., fed on the eggs, larvae and nymphs; *Dolerus niger*, Kl., devoured the larvae.

Baranov (A. D.). **Полевые вредители.** [Pests of fields crops.]—**Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи.** [*Materials for the study of the injurious insects of the govt. of Moscow*], *Moscow*, v, 1914, pp. 112-130.

The following insect pests have appeared on field crops in the government during the year under review:—(1) On winter-sown grain crops: *Oscinella frit*, L., *Mayetiola* (*Cecidomyia*) *destructor*, Say, *Euxoa segetum*, Schiff., *Agriotes lineatus*, L., *Ochsenheimeria taurella*, Schiff., *Hylemyia coarctata*, Fall., and *Anthothrips aculeata*. (2) On summer-sown grain crops: *Oscinella frit*, *Phyllotreta vittula*, Redt., and *Agriotes lineatus*, L. (3) On forage grasses: *Sitones lineatus*, L., *Agriotes lineatus*, L., *Apion apricans*, Hbst., *Phytonomus* sp., and *Siphonophora pisi*, Kalt. (4) On root crops (turnips): *Phyllotreta* sp. The author has conducted special studies on the biology of some of these pests, which he proceeds to describe.

*Sitones lineatus* has done great damage to leguminous plants, especially clover, vetches and peas, in the government of Moscow during the last few years, the spring seedlings being especially affected. The weevils feed on the leaves, etc., while the larvae feed on the roots and chiefly on the small bulbs formed by nitrogen-collecting bacteria. Some other species of *Sitones* are also found in small numbers, but the following notes refer only to *S. lineatus*. The insect winters in the imago stage just beneath the surface of the soil, emerging in the latter half of April. The author reports that the weevils appeared in the spring of 1912 on some clover sown in the fields of the Moscow Agricultural Institute and after a few days only single plants remained; in 1913, various sorts of peas attracted the beetles, 3 to 5 individuals feeding on each plant; as a result 60 to 75 per cent. of the plants were destroyed. The greatest injury was done during morning hours; during the days, the beetles remain on the earth near the plants, hiding themselves in cold and rainy weather. In 1913, pairing started in the middle of May, and oviposition on peas started on 23rd May; at the beginning the female lays a small number of eggs, but after a second copulation up to 20 eggs daily are laid. A female in captivity laid from 29th May to 21st June, 276 eggs; another laid from 29th May to 4th July, 382 eggs. Oviposition proceeds from the second half of

May till about the middle of July. The eggs are laid in the earth near the roots of the plants and hatch in 14 to 16 days, the larvae as they emerge penetrating into the knobs on the roots. In the absence of sufficient knobs, as in the case of peas, the larvae perish in great numbers. Having eaten the contents of the knob, the larvae issue and live in the soil, passing from one knob to another; the adult larvae feed on the roots. The development of the larva from egg till pupation lasts 32–34 days. The larvae gradually pass deeper into the soil, the maximum depth being about 5½ inches; pupation taking place at a depth of about 1¼ inches. The first pupae were found underneath clover and vetches after 10th July. The pupal stage lasts 10–12 days; thus the whole cycle of development of *S. lineatus* requires about 60 days. Observations showed that the beetles do not pair during the same summer in which they emerge, and it is therefore assumed that there is only one generation annually. The whole life of the imago lasts about 14 months. A table is given showing the stages of the insects existing in each of the 12 months of the year. The author records his experiments on spraying with Paris green in the proportion of 1 oz. of green and about 3 oz. of freshly slaked lime in 9 gallons of water. About 50 per cent. of the beetles perished, but the insecticide produced burns on the leaves; it is intended to repeat this experiment next year on a larger scale. Great importance is also attached to the reploughing of the attacked fields at the time when the insects are in the pupal stage.

*Oscinella frit* winters in the larval stage on winter-sown wheat and rye, and on wild grasses. When dug out of the snow, the larvae were active and kept on feeding; cold has no particular effect on them. The wintering larva develops in 8 months and pupates after the first half of May, the imago appearing last year on about 28th May. The spring generation of the flies oviposited on summer-sown crops (oats, wheat, barley) and on wild grasses (*Phleum pratense*, *Alopecurus pratensis*, *Lolium perenne*, *Triticum cristatum*, *Festuca pratensis*, *Avena flavescens* and *Poa pratensis*). At the time of oviposition the crops had already tillered and the central leaf had a length of 5–6 inches; the eggs were laid on both sides of the leaves; on some plants they were laid on the stalk near the tillering knot. Usually one egg is deposited on one leaf, although plants were found bearing as many as 3 eggs at one spot. The spring egg develops in 4 days; the pupation of the larvae hatched from these eggs started on the 14th June, the imago of the summer generation appearing after the 27th June; these flies oviposited on ears of summer-sown crops and on badly grown crops. The autumn generation started flying on 17th August and oviposited on winter-sown crops (rye, wheat) their eggs developing in 7 days. The whole cycle of development of the flies of the summer and autumn generation required 30–32 days, while the winter generation requires about 9 months. From the cocoons of the flies the parasites *Rhoptromeris wildhalmi*, Kurd., and *Trichomalus cristatus*, Först., were reared, the infection of the spring generation was 30 per cent., that of the summer one 20 per cent. Owing to the small numbers of flies of the spring generation and to the fact that at the time of their appearance the plants were strong, the flies did not touch the principal stems, but oviposited on the side-shoots; the late summer crops were more affected. Figures are given showing that the flies

attack more especially the boundary strips round the fields to a width of about 9 feet; spots in the fields situated far from the borders are seldom injured. The summer generation did small damage. The winter crops, which were able to tiller before the arrival of the pests, had only their lateral shoots damaged. The earlier sowing of summer crops, the early destruction of fallen seeds, the reploughing of stubbles and the destruction of weed grasses are recommended as remedies.

*Agriotes lineatus* during 1913 injured both summer and winter crops and clover in various parts of the government. The beetles winter close beneath the surface of the soil, appearing early in spring, and pairing has been observed in the middle of May; oviposition is effected in soil rich with manure. The young larvae feed at first on roots of various plants; it is assumed that the larval stage lasts 5 years. Pupation was observed in the first half of July and takes place at a depth of 3½ inches. Only the larvae are injurious, devouring sown grain and afterwards injuring also the plants; the nature of the injuries is described. Potato baits poisoned with Paris green were used and resulted in the poisoning of the majority of the larvae.

*Euxoa segetum*, Schiff.—The caterpillars of this pest were found hibernating in their last stage, and the depth at which they winter depends on the nature of soil and its cultivation; on sandy soil, deeply cultivated, the depth was about seven inches. The author conducted some digging operations early in May in order to establish the exact time of pupation of the insects; on 9th May almost all the caterpillars had pupated. It appeared that the number of pupae on a given space was less than the number of caterpillars on the same spot last autumn; this is explained as being due to fungus diseases. There was evidence of considerable infestation by parasites. Only one generation appeared this year, the flying taking place from 10th June to the first half of July. As a remedy, it is recommended to keep the fallow lands clear from weeds.

*Phyllotreta* sp. has damaged turnips. Sticky flags were used as a remedy, and although a great number of insects were caught, the remainder kept on feeding. The plants were repeatedly drenched with dung water, and this is considered to be one of the most successful remedies.

Levtejev. (V. A.). **Наблюденія по біологіи лиственнаго пилильщика, рапсоваго пилильщика и луковой цвѣточницы.** [Observations on the biology of *Nematus erichsonii*, L., *Athalia spinarum*, F., and *Hylemyia* (*Anthomyia*) *antiqua*, Mg.]—**«Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи.»** [*Materials for the study of the injurious insects of the Govt. of Moscow*,] *Moscow*, v, 1914, pp. 94-111.

The report on *Nematus erichsonii* is the result of two years' observations conducted by the author in Petrovo-Razumovskoje, near Moscow, where the insects have appeared yearly since 1906 in increasing numbers and injure larch plantations. The author gives a description of the imago. These sawflies hibernate as a larvae in cocoons in the soil, situated close to the foot of the tree. The examination of a large number of cocoons showed that a considerable percentage of the larvae had been killed by fungus disease; in some samples, 50–75 per cent.

of the cocoons were affected. Some 40–50 per cent. of the cocoons were also infested by parasites, the description of which is held over. The author mentions that in August 1913 he found empty fresh cocoons with holes gnawed in them, which are attributed to some predaceous insect. The larvae in the cocoons pupate in spring, and the sawfly emerges about a fortnight later, usually during May. Oviposition starts a fortnight after the issue of the imago. The eggs are deposited in two lines on the topmost buds of young shoots of larch, also under the tender bark of the upper part of the shoots; the author's observations do not confirm the view that the higher branches are preferred by the females for oviposition, but it appears that on the sides of the trees exposed to the sun and sheltered from the wind, the percentage of infested branches is greater. The eggs are found also, although more seldom, in the cavities of the bark, where they are laid in lines parallel to the direction of the cracks. The eggs hatch about the end of the first week in May, and the young larvae attack the more tender needles. Later they congregate and form large nests containing as many as 40 individuals, but after the fourth moult (there being five in all) the larvae feed separately. The young larvae cling closely to the needles and cannot be dislodged even by violent shaking, but the older larvae let themselves fall readily. The greatest damage to the trees is done in the first half of July, when the percentage of full-grown larvae is greatest. The measures employed against *N. erichsonii* are:—(1) sticky bands on the tree-trunks in order to prevent the return to the trees of the larvae which have fallen down; this remedy gave excellent results and its average cost, including the renewal of the bands, is about 1d. per tree; (2) the destruction of the cocoons by the removal and burning of the vegetable débris on the ground; and (3) disinfecting this débris with carbon bisulphide, either by means of an injector, or by placing in the litter small balls of cotton waste moistened with this chemical.

*Athalia spinarum* has done considerable damage to turnips in some localities round Moscow. The first generation is on the wing in the beginning of June, but the larvae of the second generation are more injurious, appearing in August, when the turnips are in full foliage. The larvae eat the leaves, an average of 42 larvae on a single leaf being found near one village; they feed principally in the morning. The larval stage lasts 18 to 20 days, the pupal stage about a fortnight. The following remedies were experimented upon:—(1) liming of the plants before the dew was off, which was done by sifting well-slacked lime over the leaves; the results were satisfactory, as the larvae left these plants, which were able to recover and gave good crops; (2) spraying with Paris green ($\frac{1}{2}$ lb. of green, 1 lb. of freshly slacked lime, 3 gallons of water) which gave the best results, the larva perishing in great numbers; (3) spraying with barium chloride (1 lb. of barium chloride in $4\frac{1}{2}$ gallons of water) gave less satisfactory results and burnt the leaves; (4) the larvae are greedily devoured by ducks and chickens, and poultry can usefully be let out on attacked fields; (5) the larvae may also be collected by means of an entomologist's net.

*Hylemyia antiqua* is widespread in the government and injures onions by attacking their bulbs, sometimes even boring into the leaves. Occasionally as many as 20 larvae were found on one plant, the usual number being 3–12. The first damage was noticed on 17th June,

when larvae, as well as puparia, could be found. The imago is on the wing in the second half of May. On 5th August a second generation of larvae was found, which also proved very injurious. As a remedy, the removal and destruction in June of the attacked bulbs is recommended, which will prevent the appearance of the next generation. The onions must not be pulled up from the earth, but dug out with the earth round them, as the larvae and pupae will be found in the earth attached to the roots.

SCHREIDER (A. F.). **О жукѣ оленкѣ.** [On *Epicometis hirtella*, L.]—**«Южное Хозяйство.»** [*Southern Husbandry,*] *Ekaterinoslav*, no. 5, 15th March 1914, pp. 188-189.

The author discusses measures against *Epicometis hirtella*, L., (*Tropinota hirta*, Poda). The best remedies are spraying with water, shaking the trees over sheets, and handpicking. The insects are, according to him, also attracted by blue and violet-blue colours and some fruit-growers have successfully used sheets of paper of these colours, covered with a sticky material, to attract and destroy the pests. [See also this *Review*, Ser. A, i, pp. 531–533.] The best adhesive which will withstand the heat of the sun's rays without drying for at least 5 hours, is prepared as follows :—7 parts of pine resin are melted in a kettle over a fire, after which 3 parts of unboiled linseed oil and one part of vaseline are added. Spraying with carbolic emulsion is also considered a good remedy, the odour driving away the insects, while the liquid does no injury to the plants. Trap plants, such as rhubarb, which blossom before the fruit trees, are also recommended, and from these the insects may be removed by handpicking.

Another remedy is founded on the inclination of the insects to oviposit in heavily manured soil, beds of which must be prepared in autumn in orchards and should be sown with wild Compositae, such as thistles. At the end of the next summer these beds must be dug over and the larvae collected and destroyed, the adults being easily picked by hand from the flowers.

SACHAROV (N.). **Вниманію Садоводовъ.** [For the attention of fruit growers.] **«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza,*] *Astrachan*, no. 3, March 1914, pp. 159-162.

The Entomological Station of Astrachan directed the attention of fruit-growers to *Aphis pomi*, *Anthonomus pomorum*, *Psylla pyri*, and *Rhynchites auratus*, which had already started their activities. *Psylla pyri* had oviposited on 23rd March. *A. pomorum* was observed on buds of apple trees after 25th March, while *Aphis pomi* hatched from the hibernating eggs on 28th March and had attacked the unfolding buds. The author recommends starting at once to fight these pests, and describes the usual remedies. He further points out that *Biston pomorius*, sp. n., did considerable damage to quinces during last year in some localities. The females oviposited from 26th March on quinces in enormous numbers, each female laying 1600–1800 eggs, and the caterpillars were expected to hatch out in about 12 days. He recommends spraying the quince trees with Paris green before the blossoming and again after ; about 1 lb. of green and 2 lb. of lime in

about 80 gallons of water is the proportion recommended. The young caterpillars are rapidly killed by this liquid.

VERMOREL (V.) & DANTONY (E.). **La Défense de nos Jardins contre les Insectes et les Parasites.** [The defence of our gardens against insects and parasites.]—*Bureaux du Progrès Agricole et Viticole, Villefranche-Montpellier,* 1914, 227 pp. 67 figs., 12 col. pls. (price. *fcs.* 3.50.)

This little book is intended for purely practical purposes and only pretends to deal with serious pests of the garden. The authors have omitted all processes which, in their opinion, are of doubtful value and also those which involve the use of secret preparations of unknown composition. They state that the chemical processes for the destruction of insect pests which are both practical and inexpensive, are not numerous and that the collection of the insects, the treatment of trees and plants with hot water and the use of traps of various kinds, are really the best methods. The authors consider that attention should be chiefly directed toward destruction of insects by their parasites.

The book is divided into three parts, the first dealing with the insects themselves, the second part dealing with fungoid diseases, and the third with means of control or prevention. The insecticides are classed as external, mixed, and internal, and a short chapter is devoted to natural parasites. Fungoid diseases and their remedies are dealt with at considerable length, and there is a short, but practical chapter on general orchard and garden hygiene. At the end of the book a list of fruit trees and garden plants is given, together with the principal pests of each and the months of their occurrence.

There is a good index and 12 coloured plates, which are likely to be useful to the gardener in enabling him to recognise certain of the more important pests.

FUCHS (G.). **Ueber Parasiten und andere biologisch an die Borkenkäfer gebundene Nematoden.** [On parasitic and other Nematodes biologically associated with Bark-Beetles.]—*Verh. Gesell. Deuts. Naturf. Aerzte, Dresden,* lxxxv, no. 2, pt. 1, 1914, pp. 688-692.

An account is given of Nematodes associated with bark-beetles, particularly with the species *Ips typographus,* which damages pine, and with the weevil *Hylobius abietis.* Some of these Nematodes are true parasites, while others such as *Tylenchus macrogaster, T. major,* etc., live free in the holes of the beetles, but not as parasites. The parasite of *I. typographus* are *Tylenchus contortus typographi* and *T. dispar typographi,* both of which live in the body cavity of the host. Their effect upon the beetle is to lower its general activity, and in particular its egg-laying capacity ; healthy beetles lay on an average 60 eggs in a batch, while parasitised individuals lay only about half this number. The species parasitic on *Hylobius abietis* belongs to a genus nearly related to *Tylenchus,* for which the author proposes the name *Tylenchomorphus.*

In general, the nearly related hosts are parasitised by nearly related Nematodes, each species of host having its specific parasite.

PICARD (F.). **Les Entomophthorées, leur parasitisme chez les insectes.** [Entomophthoraceae as insect parasites.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux,* xiii, nos. 1, 2, 3 & 4; Jan., Feb., March, and April, 1914; pp. 1-7, 25-30, 37-40 and 62-65; 3 pls.

The Entomophthoraceae nearly all parasitise insects and speedily kill them. An epidemic of entomophthorous muscardine is easily recognisable, as the powder-covered bodies of the hosts are found, usually in numbers but sometimes singly, on the tips of grass, etc., in curious characteristic positions, not noticeable in true *Beauveria* muscardines. The work of both Roubaud in 1911 and Hesse in 1913 shows that flies are infected by ingesting the spores. *Empusa muscae* was first bred artificially by Hesse. The impossibility of breeding such fungi artificially has been so far the chief obstacle to their employment in pest control. *Empusa muscae,* Cohn, is found on various Muscid flies and on some Syrphids. If the rainy season be followed by cold weather, as in Northern Europe, but few flies will be found in the winter, for the cold will prevent the development of new generations to replace those killed by *Empusa* during the rainy season. In the South, the sunny days of November favour this replacement, and the weather being dry, *Empusa* is set back. Thus, though cold is a factor in destroying house-flies, it can only act in conjunction with damp. *Empusa plusiae,* Giard, parasitises a Noctuid larva, *Plusia gamma,* very injurious to agriculture. *Empusa planchoniana,* Cornu, is one of a series which attack aphids. In 1898, Mattirolo studied this species in Italy and showed its control value in connection with many species of these insects. *Empusa fresenii,* Novakovski, and *E. lageniformis,* Thaxter, are also aphid parasites. *E. ovispora,* Nov., parasitises various Diptera, *Lonchaea, Sapromyza,* and especially the Syrphids. *E. grylli,* Fresenius, (= *Entomophthora calopteni,* Bessey) is one of the best known species. It has been mentioned as a parasite of Orthoptera, especially ACRIDIIDAE, and of Lepidopterous larvae. In reality it is probable that the form attacking the larvae (*E. aulicae,* Reichardt) is specifically distinct from the true *E. grylli.* Cross-infection experiments have never succeeded. It is further remarkable that attempts to effect contamination between two different species of Acridians usually fail, though the disease can readily be transmitted to another individual of the same species. This seems to show that the fungus which has adopted itself to a given species becomes less and less able to live on others. *E. aulicae* appears to be proper to caterpillars, particularly Arctiid larvae. Speare and Colley have succeeded in infecting the gipsy moth with this fungus to a degree which seems to give practical control. In France, *E. aulicae* is the great enemy of the "woolly bear," *Arctia caja,* and saves the vineyards from destruction. The genus *Entomophthora* is very closely related to *Empusa.* One of the most common species is *E. sphaerosperma,* Fres., (*E. radicans,* Brefeld). It has been observed on Neuroptera, Hemiptera, Hymenoptera, Coleoptera, Diptera and Lepidoptera. *E. phytonomi,* Arthur, usually held to be synonymous with *E. sphaerosperma,* attacks the larvae of the lucerne beetles (*Hypera variabilis* and *H. punctata*). *E. arrenoctona,* Giard, attacks *Tipula paludosa,* only killing the males. *E. muscivora,* Schröter (*E. calliphorae,* Giard) parasitises adult flies of the genus *Calliphora.* Many other *Entomophthora* are special to the Diptera.

Such are *E. culicis*, Fres., *E. variabilis*, Thaxt., and *E. gracilis*, Thaxt., found on mosquitos; *E. conica*, Nov., *E. montana*, Thaxt., found on *Chironomus*; *E. sepulchralis*, Thaxt., and *E. dipterigena*, Thaxt., found on TIPULIDAE; and *E. scatophagae*, Giard, on a coprophagous fly, *Scatophaga merdaria*. Among the *Entomophthora* of Lepidopterous larvae, the author also mentions *E. saccharina*, Giard, *E. apiculata*, Thaxt., *E. virescens*, Thaxt., and *E. geometralis*, Thaxt. *E. aphidis*, Cohn, and *E. occidentalis* are found on aphids. Earwigs are attacked by *E. forficulae*, Giard, and adult Elaterids (*Agriotes* and *Elater*) by *E. carpentieri*, Giard. So far, attempts made to use Entomophthoraceae in insect control have not been successful, though the author mentions the work of Speare and Colley. Even here, he doubts whether the results obtained may not have been due in great part to natural epizootics.

WÜNN (H.). ***Filippia oleae* (Costa) Signoret, eine für die deutsche Fauna neue Coccide.** [*Filippia oleae*, Costa, a Coccid new to the German fauna.]—*Zeits. wissen. Insektenbiol., Berlin*, x, no. 4, 20th April 1914, pp. 131-134.

This Coccid was taken by the author on leaves of *Hedera helix*, in the neighbourhood of Sulzmatt, in Upper Alsace. It has been recorded from the south of France, Algiers, Italy, Dalmatia and the warm parts of south-west England.

MOLZ (E.) & PIETSCH (W.). **Beiträge zur Kenntnis der Biologie der Gartenhaarmücke (*Bibio hortulanus*) und deren Bekämpfung.** [An account of the biology of *Bibio hortulanus* and methods of controlling it.]—*Zeits. wissen. Insektenbiol., Berlin*, x, nos. 3, 4, 15th March and 20th April 1914, pp. 98-105, 121-125.

An account is given of the work done by the authors at the experiment station at Halle, on the biology and control of *Bibio hortulanus*, a pest of sugar-beet, barley and oats. From the results of their experiments, they recommend that in early May, when the pupae are below the surface of the soil and are about to emerge, deep ploughing should be carried out, followed by rolling; this prevents the emergence of a large number of insects. In the second half of May, to entrap the adults that have emerged, straw should be spread in those places in the field where it was noticed that larvae were particularly numerous. The straw attracts the flies; it should be spread overnight and should be collected in sacks and burnt early the next morning. Stable manure should not be used in the fields, as it is a favourable breeding place for the insect. If, on account of the time at which the seed for the crop must be sown, May tilling be too late, the ploughing may be done in April and followed by frequent harrowing; this exposes the larvae to dryness which is unfavourable to their existence.

MORLEY (B.). **A Larva Plague in Deffer Wood, Yorks.**—*Naturalist, London*, May 1914, pp. 151-153.

For some years a few species of spring-feeding caterpillars have been so numerous in Deffer Wood, near Skelmanthorpe, Yorks, that by mid-June they have completely eaten up all the foliage. The effect

of these four years of defoliation has been disastrous to the trees; they have now a stunted appearance and, owing to growth being repeatedly arrested, they have many dead twigs and boughs. The species incriminated are the following:—*Phigalia pilosaria, Himera pennaria, Hybernia defoliaria, H. aurantiaria, Oporabia dilutata, Cheimatobia boreata, C. brumata* and *Tortrix viridana.* Insectivorous birds are not uncommon, and must have destroyed large numbers of the larvae, but evidently not sufficient to keep them under control.

DEW (J. A.). **Some Properties of various forms of Arsenate of Lead.**—*Jl. Econ. Entom., Concord.*, vii, no. 2, April 1914, pp. 162-167.

The present paper is a preliminary report of the work done by the author during the past year to determine what forms of arsenate of lead are the most effective, and what characteristics give the insecticide its value. The experiments led to the following results and conclusions: The lowest number of units of $As_2O_5$ necessary to give an effective control of the plum curculio (*Conotrachelus nenuphar*), this being the insect experimented on throughout, is 33. One pound of an acid arsenate of lead (33 per cent. arsenic oxide) has more killing power than a pound of neutral arsenate of lead (25 per cent.–27 per cent. arsenic oxide), and each has more killing power than one pound of basic arsenate of lead (20 per cent. arsenic oxide). Under similar climatic conditions, the killing power of an acid or a neutral arsenate of lead depends directly upon the percentage of arsenic oxide that it contains. Basic arsenate of lead, under the climatic conditions prevailing while the experiments were being carried on, became too slowly available to give good results, even when double quantities were used. When used in accordance with the spraying practice of the present day, all trees sprayed with these different forms of arsenate of lead shed a comparatively large number of fruits showing no insect injury; constant characteristics of these fruits are that the stems remain on the tree and the fruits show a slight shrivelling at the base. The number of these shed fruits varies with the form of arsenate of lead used, the acid forms causing the greatest percentage of loss; it is independent of the $As_2O_5$ content of the spray.

MELANDER (A. L.). **Can Insects become resistant to Sprays?**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, pp. 167-173.

Owing to a prevalent feeling in some districts that the lime-sulphur spray is less efficient now than formally in controlling San José scale, it has been suggested that it is possible for the insect to become immune to the toxic effects of the spray. For several years, in spite of every precaution having been taken by the growers, the San José scale has been increasingly prevalent in the Clarkston Valley, Washington. This led the authors to try identical solutions in a number of localities, and to make bi-weekly counts of the proportion of living and dead scales. It was found that the normal action of the lime-sulphur spray is continuous, producing complete destruction of the scale in a little more than a month's time. In the Clarkston experiment, however, from 4–13 per cent., or more, of the scales were alive six weeks after the spraying, at which time they had begun their

spring growth and were probably but little susceptible to whatever weathered lime-sulphur remained. Oil sprays experimented with were fatal to scales in all the localities. There seems no doubt that some of the scales are resistant to the lime-sulphur spray, as all were subjected equally to it, and if this be so, an extreme view would be that from these resistant forms might arise a race that would be quite immune. Viewed from a Mendelian standpoint, the consequences are less alarming, as there are always some scales missed by the spraying, and these would produce a population in part, at least, non-resistant. As the spraying affects every tenth generation or so, the immunity is not likely to make itself felt over so long a period, if acquired during the life-time of the individual; and further, resistance appears to act as a Mendelian recessive character, so that crosses with non-resistant individuals would produce non-resistant hybrids.

Practically, a change from lime-sulphur to an oil spray is all that is necessary for effectual control. Should forms resistant to the oil spray arise, it would be necessary to use both insecticides, and if then the same individuals were resistant to both, it might be necessary to introduce a weak strain of the San José scale to cross with the immunes and thus induce a return to the normal susceptible population.

PADDOCK (F. B.). **Observations on the Bee-Moth.**—*Jl. Econ. Entom. Concord*, vii, no. 2, April 1914, pp. 183-188.

The bee-moth (*Galleria mellonella*, L.) is now found in Italy, Germany, France, England, Ireland, India, Australia and the United States. Work has been done in the College Station, Texas, for the purpose of identifying the generations of this insect. In this region there are three; the third is not so large as the first two, owing to the fact that a portion of the second brood of larvae does not pupate until late in the autumn. There is a decided overlapping of generations, and all stages may be found at almost any time in an infested hive. In April, moths from the hibernating larvae and pupae mature and lay eggs; these hatch during May and the larvae are about three-fourths grown by the end of the month. In June, pupation begins and continues in July; adults of the second generation emerge in July and deposit eggs. In August, larvae and pupae of the first generation are still to be found, and also the moths, eggs and larvae of the second generation. In September, the larvae of the second generation pupate and the moths of the third generation emerge and lay eggs; all stages of the second generation are still to be found. In October, there are still moths and eggs of the third generation; the larvae and pupae of the third generation are found in November, December, January and February; by March all have pupated.

Three hymenopterous parasites of the bee-moth have been recorded; one is a Chalcid, *Eupelmus cereanus*; another is a Braconid, *Bracon brevicornis*; the third is *Apanteles lateralis*; this latter was discovered near Lyons, where it was found to spread very rapidly. A small red ant, *Solenopsis* sp., has been found to be an enemy of the bee-moth; it destroys both moths and larvae. Fumigation has proved the best means of artificial control. It has been found experimentally that only extremely large doses of sulphur will affect the eggs of the bee-

moth. Carbon bisulphide fumes were very efficient in killing the larvae, and were in every respect very satisfactory as a fumigant.

Herrick (G. W.). **Oviposition of two Apple Pests.**—*Jl. Econ. Entom., Concord,* vii, no. 2, April 1914, pp. 189-192, 3 figs.

For two seasons the green fruit worm (*Xylina antennata*) has been prominent among the insect pests of apples, pears and in some instances, sour cherries. The adult and larval stages of this insect have been described and also its habits and distribution, but not the eggs or egg-laying habits. The author has studied this part of the life-cycle, and finds that the eggs, in the insectary, were deposited in the leaf scars on the stems and branches, and also on the underside of the leaves; from observations in the field it seems that the eggs are laid singly on the branches before the leaves appear.

The Palmer worm (*Ypsolophus pometellus*) is an erratic pest of apples; it is however becoming more common and persistent than formerly. The eggs are laid on the leaves, among the hairs on the underside; they are very small and inconspicuous; in general they are oval and pink in colour. The incubation period of these eggs is probably about 7 days.

Cooley (R. A.). **Two New Insect Pests of Currants and Gooseberries.**—*Jl. Econ. Entom., Concord,* vii, no. 2, April 1914, pp. 193-195.

A weevil, *Pseudanthonomus validus*, Dietz, and a new species of Thysanoptera, *Liothrips montanus*, are recorded for the first time as pests of currants and gooseberries in the United States. *P. validus* appears as an adult in the spring at the time when the young currants are forming; numerous punctures are made with the long beak on different parts of the fruit, particularly near the point where the stems are attached; the eggs are laid in the pits near the stems. The larvae hatching from the eggs pass to the centre of the fruit and feed on the seeds; they reach full size by the time the currants are mature. The pupal stage is passed in the destroyed fruit; after emerging the adults live for a short time on the bushes and then burrow into the ground to hibernate. This weevil was found on the Montana Experiment Station, while investigations were being made on the currant fruit fly (*Epochra canadensis*). The weevils were found to be three times more numerous than this fly. The author proposes the name Currant Fruit-Weevil for *P. validus*.

The second insect referred to was found on gooseberries, and red and black currants in Bozeman, the bushes having suffered a peculiar injury to the tender terminal growth of the shoots. The leaves of the affected stems were distorted, undersized and showed distinct spots, suggesting the attacks of an insect with piercing mouth-parts. The insect was found to be *Liothrips montanus*, a recently described species (see this Review, Ser. A, i, p. 515). The young, which are bright red with black head and legs, may be found on the bushes soon after growth starts. The species apparently hibernates in the adult stage. Preliminary control tests were made with commercial lime-sulphur, 27° Beaumé, and also "Black Leaf 40" and soap, the tobacco extract being in the proportion of 1 to 1,000. The lime-sulphur

solution killed many of the thrips, but the tobacco extract was distinctly more effective, destroying practically all the insects. The name " Currant Thrips " is proposed for this insect.

FERNALD (H. T.) & BOURNE (A. I.). **Note on the Onion Thrips and the Onion Maggot.**—*Jl. Econ. Entom., Concord*, no. 2, April 1914, pp. 196-200.

" Onion Blight " is very common and serious in the onion-growing districts of New England. The trouble is caused by *Thrips tabaci*, Lind., which is widely distributed over the country. The insect hibernates as an adult in sheltered places, generally in the refuse left on the onion field, or at the base of grasses on uncultivated fields and along roadsides near the onion fields. The insects pass to the onion plants in spring, locating themselves on the leaves to suck the juices. Of the control measures attempted, that which was found most satisfactory was the careful destruction of all refuse after the crop was gathered, and the burning of all strips of grass in and around the fields.

Another pest which has done much injury to the onion crop in Massachusetts is the onion maggot. Many treatments for this pest have been advocated; of these, the author selected the eight most promising for trial, namely: carbon bisulphide, " nicine," powdered hellebore, hellebore decoction, soap wash, carbolic acid and lime, kerosene emulsion, and carbolic acid emulsion. The conclusions drawn from these tests were that none of the treatments is entirely satisfactory, and that most of them are in any case prohibitive because of the expense. Carbolic acid emulsion gave the best results; its cost was from 35–50 dollars (7*l*. 5*s*. 10*d*.–10*l*. 8*s*. 4*d*.) per acre. Dating from the past season, experiments are being made at the present time to find some less costly method of treatment.

GIBSON (A.). **A New Destructive Cutworm of the Genus** *Porosagrotis* **occurring in Western Canada.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, pp. 201-203.

The cutworm *Porosagrotis delorata*, Sm., which until 1911 was not regarded as a pest in Canada, and was indeed extremely rare, has since that date been the cause of several cases of severe injury to grain crops. In the Lethbridge Land District, it has been estimated that 33 per cent. of the grain sown was ruined, while in the southern part of the Province of Alberta 30,000 to 35,000 acres of grain have been destroyed. The investigation of the life-history, habits, methods of control, etc., were begun by the author in Alberta in the spring and summer of 1913. Experiments were made in the fields to test various strengths of Paris green, salt, and sugar mixed with moistened bran. The poisoned bait was scattered over the fields in the usual way. London purple and lead arsenate were also tried. The results were unsatisfactory, only about 25 per cent. of the cutworms being killed. This was possibly due to the underground feeding habits of the caterpillars, which travel over the surface of the soil until a suitable plant for attack is found, and then burrow and feed just below the surface. At Raymond, 26 miles from Lethbridge, in large fields of sugar-beet, an attack of cutworms was stopped within 24 hours after the bran was

applied, the cost being only 30 cents per acre. Further experiments are being made in the case of the grain fields at Lethbridge.

HINDS (W. E.). **Reducing Insect Injury to Stored Grain.**—*Jl. Econ. Entom., Concord,* vii, no. 2, April 1914, pp. 203-211.

The author states that in economic value for the Southern States the problem of reducing insect injury to stored grain is only second in importance to that of controlling the Mexican cotton-boll weevil. There are several species of insects concerned in the injury to stored maize, their relative importance varying in different parts. The most generally important of these species include two moths, the Indian meal snout moth, *Plodia interpunctella,* and the Angumois grain moth, *Sitotroga cerealella,* and three or four small beetles, known generally as enemies of stored products :—the rust red beetle, *Tribolium ferrugineum,* the flour beetle, *T. confusum,* the square-necked grain beetle, *Cathartus gemellatus,* and the saw-toothed grain beetle, *Silvanus surinamensis.* More important than all of these is the so-called rice-weevil, *Calandra oryzae,* L., known also as the black weevil. This is the species with which the present paper is concerned, though what is effective for its control is effective likewise in reducing injury by most of the other species.

It has been observed that different varieties of grain offer varying degrees of resistance to the attacks of the weevils. Various kinds have been tested and it would appear that among the requisite characters of a resistant, as well as an otherwise good variety, are large yield, sound grain, thorough husk-covering and pendant ears. Seed selection should be practised in the field at the time of harvesting.

To protect upland maize, a few rows of a more rapidly maturing variety should be planted a few weeks in advance of the main crop ; this serves to concentrate the weevils. These " trap rows " should be gathered six weeks after the maize passes the " roasting ear " stage ; this serves to keep the weevils on these ears and secures their removal from the field when the maximum number of old weevils are present and before the first autumn generation is ready to emerge and spread into the main crop.

Regarding harvesting methods, it is recommended to strip the sheaths off the ears as soon as the maize is gathered, thus leaving three-fourths of the weevils in the field. Weevils shaken off into the bottom of the wagons should be swept away, when there is no fear of their finding their way back again.

Where weevils are present at storage time, there is no better way than to fumigate with carbon bisulphide ; this should be done on a warm day, using 20 lb. per 1,000 cubic feet. A spring treatment in March, if well carried out, is all that is likely to be required after that time. [See also Bull. 176, Alabama Agric. Expt. Sta., Feb. 1914.]

HEWITT (C. G.). **Sterility in Oats caused by Thrips.**—*Jl. Econ. Entom., Concord,* vii, no. 2, April 1914, pp. 211-219, 1 pl. 1 fig.

In 1911, the author investigated injury to oats caused by the Grass Thrips, *Anaphothrips striatus,* Osborn, which had occurred in Saskatchewan, Alberta, Vancover and Ottawa. The lower spikelets

of affected inflorescences were small, whitish and shrivelled. Counts of the shrivelled spikelets on each inflorescence on different experimental plots gave an average of 17·3 per cent. to 36·3 per cent.; the average percentage differed with the variety of oats in question, the variety known as "Abundance, Garton's Regenerated" being least affected, while that known as "Banner M" suffered the greatest injury. The damage is chiefly confined to the inflorescence, and usually to the lower part of it, though not invariably; the white shrivelled spikelets are quite conspicuous in comparison with the normal green healthy spikelets.

The life-history of *A. striatus* is briefly as follows: The females deposit their eggs on the leaves of cereals or grasses, and the young larvae develop in the autumn until the snow covers the ground, but only the adults appear to survive the winter. These are able to withstand temperatures as low as $-53°$ F. (Saskatchewan). The females begin ovipositing early in the spring, each laying from 50–60 eggs; incubation takes from 10–15 days in spring; in the summer from 4–7 days. The larval stage lasts from 2 weeks in early spring, but only a few days in summer. The winged adults appear in May or June. The whole life-cycle occupies from 12–30 days.

As *A. striatus* feeds on grasses and is able to migrate with ease, the difficulties of control are considerable. The destruction of weeds, especially grasses, is essential. The hibernation period would appear to afford one of the best opportunities for employing control measures, especially of a cultural nature, such as deep ploughing. An alternative or additional measure would be burning the stubble of an infested crop. Trap crops of rye or oats that would ripen earlier than the main crop, and which could be removed and destroyed, have been recommended.

McColloch (J. W.) & Yuasa (H.). **A Parasite of the Chinch Bug Egg.** —*Jl. Econ. Entom., Concord,* vii, no. 2, April 1914, pp. 219-227.

A two-fold interest is attached to the discovery of an egg-parasite of the chinch bug (*Blissus leucoptera*) on account of the seriousness of this insect as a pest, and because it has stood alone among staple crop insects in having no known egg-parasite. The Chalcid was discovered in the course of experiments on the chinch bug, made in the Kansas Agricultural College, and proved to be a new genus and species; it has been called *Eumicrosoma benefica*, Gahan.

The chinch bug is found in all parts of Kansas except the extreme west. The adults emerge from hibernation during the first weeks of April, and the eggs are found from the end of April to the beginning of July. The first brood reaches maturity during the early part of July, and the eggs of this brood are found from the middle of this month until October. The second brood reaches maturity from the end of August until the middle of September. These adults migrate to grass-lands, where they hibernate. The period of oviposition thus lasts through the entire summer, with the exception of a week or two in July.

The eggs of *Eumicrosoma benefica* have never been observed in the eggs of the host, and the exact length of the incubation period has not been determined. The young larva has been found shortly after it

has hatched, and the time between oviposition and the time the young larva was first seen varied from two days to about a week. The length of the larval stage varies with climatic conditions, in summer being 5–7 days, in cooler weather 10–12 days. The emergence of the imago occurs at night in warm weather, and in cooler weather during the day.

In a number of experiments conducted to determine the relation and economy of the sexes, it was found that where a male was supplied to each female a higher percentage of parasitism was obtained, and a greater number of parasites reached maturity. It was not possible to determine with any degree of accuracy the number of eggs a female could deposit. Nineteen individuals parasitised an average of 6·2 eggs; 76 of the first generation parasitised an average of 4·1 eggs; 63 of the second generation parasitised an average of 3·7 eggs; 31 of the third generation parasitised an average of 3·7 eggs. The largest number of eggs parasitised by a single female was 13. In females, before oviposition, the smallest number of eggs in the ovary was 13, the largest 29. The number of females greatly exceeds the number of males, both in the field and in the laboratory. The insect can breed parthenogenetically, but the number of eggs parasitised per female was usually low, and many of the offspring failed to develop.

The short existence of the adult is directed almost entirely towards reproduction; feeding, if any, requires a very short time. In the wheat fields the parasites were always moving about on the plants near and below the surface of the ground and, unless disturbed, seldom take to wing. Although it would seem that they spend their lives in comparatively limited areas, they range to a greater extent than might be expected; the wind probably helps in their distribution. In all experiments in which hosts other than the chinch bugs were offered to the Chalcids, parasitism did not occur.

The length of the life of the parasite varies greatly with factors such as food, temperature, etc.; it has been found to range from a few hours to twenty-five days. The first parasitised chinch bug eggs were found at the end of April, so that the parasites must have been out before this date. There are about nine or ten generations; the last parasite was observed in the middle of October.

The parasite was first discovered in a wheat field near Manhattan. Since then it has been found throughout the whole State, wherever chinch bug infestations occur. The eggs of one brood of the chinch bug are exposed to the attack of four or five broods of the parasite; at least 50 per cent. of any one brood of chinch bugs appear to be parasitised.

---

HODGKISS (H. E.) & PARROTT (P. J.). **The Parasites of the San José Scale in New York.**—*Jl. Econ. Entom., Concord,* vii, no. 2, April 1914, pp. 227-229.

Parasites of the San José scale (*Aspidiotus perniciosus*) were numerous during 1913 in New York. To determine the range and species of these insects, infested wood was collected from unsprayed trees in the more important fruit-growing districts of the State. From the material the authors reared the following species:—*Prospaltella perniciosi,* Tower, *Aphelinus fuscipennis,* Howard, *A. diaspidis,*

Howard, *Signiphora nigrita*, Ashmead, and *Perissopterus pulchellus*, Howard. The last two species appear to be comparatively unimportant. Taking the State as a whole, the breeding records for September and October 1913 indicate that *P. perniciosi* was probably the most numerous species; *A. diaspidis* predominated numerically in two counties, while *A. fuscipennis* ranked first in three counties.

To determine the ratio of parasitism, counts were made of the scales after the rearings of the parasites were completed. Some 20,000 individuals were examined, of which about 3,500 contained exit holes of the Hymenoptera. The percentage of scales affected varied between 12 and 24 per cent. for the entire State. Some attention was also directed to the occurrence of parasites in orchards which had been regularly sprayed with lime-sulphur mixture; in some instances 12 per cent. of the scales were destroyed by parasites. In orchards that have been treated with the spray for a number of years, 7 per cent. of the scales were parasitised. The result of these studies is to show that the different species of parasites vary a good deal locally, both in their numbers and relative importance.

Shelford (V. E.). **The Importance of the Measure of Evaporation in Economic Studies of Insects.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, pp. 229-233.

Environmental factors influence organisms in respect of their migrations, either by producing death, or by modifying their metabolism, fecundity, length of life, size, etc. Evaporation determinations show to some extent the conditions of temperature, moisture, wind movements and isolation, and for this reason afford certain data regarding environmental factors. The author has experimented upon the rate of evaporation upon insects and more particularly upon frogs, salamanders and toads, and he finds that the effects of evaporation upon the animal are the same, whatever the cause be (dryness, temperature, etc.). The experiments were made with the Livingstone porous cup atmometers, which are described by the author on p. 249 of the same number of the Journal.

Hunter (W. D.). **Quarantine against the Mexican Cotton-Boll Weevil.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, pp. 234-240.

The author recapitulates the specific points in the life-history of the Mexican cotton-boll weevil which justify legislation against it. He is of the opinion that prohibition, established by specific laws, on account of its inflexibility is more unsatisfactory than regulations formulated by boards under general authority, which are better suited to the needs of individual localities. A summary is given of the restricted or prohibited articles in the different southern States. In support of the prohibition system, the author states that since it has been in practice, no sporadic outbreaks of the weevil have occurred in districts beyond its range of flight from already infested districts; it is therefore likely that many introductions have been prevented and that the resulting good far exceeds the temporary interference with shipping that the restrictions have caused.

King (G. B.). **The Genus *Pseudokermes* in Montana.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, pp. 246-247.

A new species of the genus *Pseudokermes*, *P. cooleyi*, has been taken on *Picea englemanni* at Corvallis, Ravalli County, Montana. The insects were not abundant on the tree. The species is described.

Weiss (H. B.). **Notes on Three Imported Insects occurring in New Jersey.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, p. 250.

*Aspidiotus tsugae* was imported in Japanese hemlock into New Jersey in 1910. It was believed that the pest had been entirely stamped out, but the appearance of a few scales in 1914, in the same locality as that in which the original discovery had taken place, shows that the scale has gained a slight foothold. Further steps are being taken to stamp out the pest. *Agrilus sinuatus*, a Buprestid imported in 1894, probably from France, is holding its own in New Jersey, although it has ceased to be destructive. *Kaliosysphinga dohrnii* was first noticed in New Jersey in 1913, where it had infested alder trees so badly that they were almost completely defoliated.

Merrill (D. E.). **A Coleopterous (Clerid) Larva Predaceous on Codling Moth Larvae.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, pp. 251-252.

While examining some old bands for codling moth larvae in an orchard near Mesilla Park, N.M., in 1912, the author found a coleopterous larva in the cocoon of a codling moth, the host caterpillar having been partially eaten. The predaceous larva was placed in a jar with some earth and a few codling moth larvae. In the spring it was found in the cocoon of one of the moths. The insect was a species of Clerid, but no specific identification was made. It appears to be quite common in New Mexico.

Mason (P. W.). **The Twig Girdling Habit of *Hemerocampa leucostigma* by Caged Specimens.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, p. 252.

Caged larvae of the Lymantriid moth, *Hemerocampa leucostigma*, are described as girdling elm twigs. In May 1913, a twig of new growth was found eaten into for about 7 mm. in length and more deeply at the base, so that it was just hanging by the bark of the lower side. A few days later several more twigs had suffered in the same way, some being entirely cut off, and others only partially eaten. In all cases only new wood was affected. The habit has not been observed in the open.

Jackson (H. S.) & Wilson (H. F.). **How and When to Spray the Orchard.**—*Oregon Agric. Coll., Corvallis, Bull.*, no. 123, Extension Series ii, no. 177, Jan. 1914, 23 pp.

"Black Leaf-40" is a commercial spray which is diluted, 1 part to 1,000 parts water or to 1,200 parts of diluted lime-sulphur spray, and provides

a very efficient insecticide against plant lice, scale-insects, etc. Soluble sulphur compound is a comparatively new spray now sold throughout the United States and Canada and claimed to be equal to lime-sulphur. It has been tried at Corvallis in a limited way against the San José scale and found to be efficient. Growers should not assume that because this substance and lime-sulphur are similar in composition the one can in all cases replace the other. "Atomic sulphur," primarily used for fungous diseases, may be used against various mites. Pyrethrum powder may be used either as a powder or in a water solution, 1 lb. in 50 gals., and is available against the pear and cherry slug if poisons are undesirable. Kerosene emulsion is always satisfactory if the emulsion is properly prepared from good materials. A standard formula is :—Whale-oil soap ½ lb., water 1 gal., kerosene 2 gals. This forms 3 gals. of stock solution which can be diluted to any required strength by adding water. To get the amount of water for any given percentage, divide 200 by the percent, subtract 3 from the quotient, and this gives the amount of water necessary to add to each 3 gals. of stock to obtain a working solution of the required strength. Example: For a 15 per cent. solution, 200 divided by 15 gives 13⅓ and if 3 is subtracted the result is 10⅓. If 10⅓ gals. water are added to 3 gals. stock a 15 per cent. working solution is obtained. Crude oil emulsion is somewhat similar to kerosene emulsion, except that liquid whale-oil or fish-oil soap should always be used. Distillate oil emulsion is not yet commonly used in Oregon, but is well known in California, where it is combined with "Black Leaf-40" for pear thrips. It is made as follows :—Dissolve 30 lb. of whale-oil soap in 12 gals. of boiling water, and add 20 gals. of distillate (28 degrees Beaumé) while still hot. Mix thoroughly to make a complete emulsion. One part of this stock solution is diluted with 20 parts water for use.

All the foregoing are contact poisons. The food poisons are usually arsenicals, at present used in the form of arsenate of lead and arsenite of zinc. For codling moth and leaf-eating insect control, arsenate of lead is now the standard remedy. Most commercial brands are a mixture of the two arsenates known as acid and neutral arsenates of lead; but these names are misleading to the fruit-grower, because of the suggested presence of an acid of some sort, which is not the case. The Oregon Experiment Station designates them as *lead hydrogen arsenate* and *basic arsenate*. Experiments have shown that the former acts more quickly and being more finely divided will remain in suspension much longer. It was further shown that in combination with lime-sulphur and in strengths containing equal percentages of arsenic oxide, the lead hydrogen arsenate was as efficient as, or more efficient than, the basic. (This does not mean that the former combination is recommended for orchard practice). Considerable experimental work yet remains to be done, but except where otherwise directed, the lead hydrogen arsenate is recommended when used without lime-sulphur.

A combination spray has both insecticide and fungicide properties. As a winter spray one application of lime-sulphur each year will do more for the neglected orchard than can be done in any other way by the same expenditure of cash and energy. It not only destroys the San José scale, but it may also destroy the branch form of the woolly

aphis, the pear-leaf blister mite, the hibernating larvae of the bud moth, and other insects which may chance to be wintering upon the trees. It is also a good fungicide, being nearly or quite equal to Bordeaux mixture. As a summer spray the work done at the Oregon Station proves that properly diluted lime-sulphur can be used on the pear with reasonable safety The results showed further that it is much less likely to produce the disastrous " spray injury " to fruit which is so common, and often serious, when Bordeaux mixture is used. Careful experiments have demonstrated that the commercially prepared lime-sulphur solutions are fully equal to the old home-made spray, but they retail at from 7 to 10 dollars per 50-gallon barrel, whereas the quantity of lime and of sulphur required to prepare 50 gals. of stock solution costs at the present retail prices, approximately 3 to 4 dollars. Materials: best finely ground sulphur 100 lb., lime (best grade, unslaked) 60 lb., water sufficient to make 50 gals. Slake the lime, mix the sulphur into a thin paste with a little water, add it to the lime, add sufficient water to make, all told, 60 gals; bring it to a boil and boil vigorously for 30 to 35 minutes, stirring constantly. The sediment is then allowed to settle. Every grower who wishes to prepare his own spray should have a Beaumé acid scale hydrometer for testing the strength of the solution. The authors give a table of dilutions corresponding with the Beaumé degrees from 22 to 32. A home-made lime-sulphur mixture perfected by Mr. Scott of the U.S. Department of Agriculture is prepared as follows :—The mixture can best be prepared in rather large quantities, say enough for 200 gallons at a time, making the formula 32 lb. of lime and 32 lb. of sulphur, to be cooked with a small quantity of water (8 or 10 gallons) and then diluted to 200 gallons. The lime should be placed in a barrel and enough water almost to cover it poured on. As soon as the lime begins to slake, the sulphur should be added, after first running it through a sieve to break up the lumps. The mixture should be constantly stirred and more water added as needed to form a thick paste at first and then gradually a thin paste. The lime will supply enough heat to boil the mixture several minutes. As soon as it is well slaked, water should be added to cool the mixture and prevent further cooking. It is then ready to be strained into the spray tank, diluted, and applied. The stage at which cold water should be poured on to stop the cooking, varies with different limes. Some limes are so sluggish in slaking that it is difficult to obtain enough heat from them to cook the mixture at all, while other limes become so intensely hot on slaking that care must be taken not to allow the boiling to proceed too far. If the mixture be allowed to remain hot fifteen to twenty minutes after the slaking is completed, the sulphur gradually goes into solution, combining with the lime to form sulphides, which are injurious to peach foliage. It is very important, therefore, especially with hot lime, to cool the mixture quickly by adding a few buckets of water as soon as the lumps of lime have slaked down. The intense heat, violent boiling and constant stirring result in a uniform mixture of finely divided sulphur and lime, with only a very small percentage of the sulphur in solution. The mixture should be strained to take out the coarse particles of lime, but the sulphur should be carefully worked through the strainer.

The authors point out that while considerable success has attended

the mixture of a fungicide and insecticide in combined application, regard must be paid to the fact that in mixing more or less of a chemical change usually takes place, which may destroy the killing value of the spray. The original substances may also be changed so as to liberate some material injurious to the foliage and fruit. Such is apparently the case when lead hydrogen arsenate is mixed with lime-sulphur. It is thought that the injury which often occurs is due to the free arsenic said to be liberated. Sprays that can be successfully mixed at the present time are: Bordeaux mixture and arsenate of lead, arsenite of zinc or Paris green; lime-sulphur and arsenate of lead or arsenite of zinc; lime-sulphur and tobacco sprays; arsenate of lead or arsenite of zinc may also be added to the last mixture when desirable; iron sulphate may be mixed with arsenate of lead and "Black-Leaf 40," alone or mixed; atomic sulphur and lead arsenate; home-boiled lime-sulphur and arsenate of lead. Other mixtures have been tried and some are worthy of trial, but it is not advisable yet to recommend them for general use. The fruit-grower is warned against using spray mixtures which have not been thoroughly tested. The paper concludes with spray calendars for apples, pears and stone fruits.

HINDS (W. E.). **Cotton Boll Weevil infested area in U.S. and quarantine line in Alabama, 1913-14.**—*Alabama Agric. Expt. Sta., Auburn, Press. Bulls.* nos. 69 & 71, 15th Jan. & 25th Feb. 1914, 1 p. and 4 pp., 2 maps.

The boll weevil advance in Alabama for 1913 was unexpectedly interrupted by very early frosts, which occurred almost a month earlier than the first killing frosts usually do. Some sheltered localities escaped killing temperatures, and as usual the greatest advance occurred along the southern edge of the State. The author remarks that it was doubtless only the early hard frost which stopped the boll weevil entering Georgia this year, and it is sure to have greatly reduced the numbers of weevils hibernating in infested counties. Though this season's infestation will probably be lighter, control measures should not be omitted. The quarantine line for Alabama for 1913–14 is shown on one map, a 20-mile safety zone being left between it and the boll weevil line for 1913; the other map shows the spread of the weevil from 1892–1913.

In *Bulletin* no. 71, details are given of the inauguration in Alabama of a plan for County Agricultural Advisory Committees, composed of a few leading men, to initiate new lines of effort and to coordinate all forces now at work in the field. It is hoped that such a group of men will be able to organise a campaign to improve, not only farming methods, but the social welfare of the farmers in a wide sense. The necessary agricultural and economic adjustments will be made gradually, by co-operative action, but at a rate that will offset the increasing capacity of the weevil for doing harm before the maximum of damage usually reached in the 3rd or 4th year of infestation. It is hoped that these committees will also render useful service among the dependant illiterate black farmers who have remained uninfluenced by the Farm Demonstration work which has so greatly benefited the better educated farmers.

Rumsey (W. E.). **The San José Scale** (*Aspidiotus perniciosus*, **Comstock**).—*W. Virginia Crop Pest Commiss., Morgantown, Bull.* no. 3, Feb. 1914, 15 pp., 3 figs.

The San José scale is dealt with at some length in this bulletin, which is intended to encourage the owners of small home orchards and of town lots to control its ravages on their premises. The life-history is described, and the fact of its being viviparous, an unusual condition among scale-insects, is mentioned. The following list of food-plants is given :—Apple, peach, apricot, pear, plum, cherry, persimmon, quince, almond, chestnut, pecan, walnut, raspberry, gooseberry, currants, and vines ; rose, hawthorn, *Spiraea*, fire thorn, *Euonymus*, English blackberry, linden, acacia, elm, osage-orange, alder, sumac, various willows, milk weed, catalpa, Lombardy poplar, Carolina poplar, golden-leaved poplar, silver maple, cut-leaved birch, mountain ash, Japanese quince, *Actinidia*, *Citrus trifoliata*, red dogwood, snowball, Juneberry, loquat, laurel and *Akebia*.

With so many food-plants to harbour them, it is impossible to exterminate San José scale when once thoroughly established in a locality, though by proper treatment it can be checked and the injury done by it greatly reduced. Under the heading of natural enemies the author points out that insect enemies cannot establish themselves among small localised infestations, as when the insect host is killed out the parasite will die of starvation ; but when the scale is more generally distributed they will be of greater value. The usual miscible oil and lime-sulphur sprays are recommended, which should be applied after the leaves are down and the wood has ripened, and before the buds open. In beginning the fight against this insect where there is a bad infestation, one application should be made in the autumn and another in the early spring. Once the pest is under control one careful spraying should suffice. Pruning the trees first will save material and labour ; care should be taken to cover the tree thoroughly from all four sides, the very small size of the scale making this necessary. The author urges the co-operation of all fruit-growers and farmers in fighting this pest.

Desmoulins (A.). **Le Puceron vert du Pêcher.** [The green aphis of the peach.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 10, 8th March 1914, pp. 314-316.

It is possible to stay infestation by removing and burning the first shoots attacked by this pest, which otherwise rapidly covers the leaves of the peach-tree and weakens it. To do this requires much watchfulness and it is not always practicable. Spraying with a solution containing 1 to 1½ parts black soap, 1 part of nicotin extract (containing 10 per cent. of pure nicotin) and 100 parts water, all by weight, is evidently efficacious, but a few leaves left untouched by the spray will be sufficient to cause the tree to be re-infested in a few days. M. Chambaud has tried another method on his 20-acre peach plantation. Using the fumigation method practised in California, he has substituted nicotin for hydrocyanic acid. Perfect results were obtained at a cost of 1½*d.* to 2*d.* per tree. The material required was : a cover measuring about 6½ yards by 9 yards, capable of covering trees of medium size ;

a small portable forge; a piece of iron weighing about 7 to 10 lb.; tobacco juice of weak strength; any kind of cast iron pan with a flat bottom allowing the piece of iron to lie flat. The cover is made of slightly fluffy cretonne costing about 9*d*. a yard. Eyelet holes are made in it, one in each of the two corners of one of the long sides, and one in each of the short sides, about 3 yards from the corner holes. The nicotin solution used was a crude tobacco juice containing about 10 per cent. nicotin, and about 3½ oz. are required per tree. M. Chambaud prefers this quality to pure nicotin as he believes the tarry products conduce to success. The operation is as follows: Two workmen hoist the cover over the tree with the help of hooked poles. The cover is hooked by the two eyelets on the short sides, that portion in which the two corner eyelets are placed being folded back on the other so as to make the cover easy to handle. The tree is then completely covered. The metal pan is hung on a branch with the quantity of nicotin stated. The piece of iron is brought to a white heat and quickly placed in the pan while two men close up the cover with a cord. Nicotin vaporises at 240° C. and the cover is soon filled with the vapours. In 5 to 6 minutes, or 10 at the outside, all the aphids are killed without any damage being done to the tree. The cost for 10 trees is worked out at: 3 hours labour at 4*d*. per hour, 1*s*.; 1¾ pints of 10 per cent. nicotin, 2½*d*. Including the cost of fuel the maximum cost of 20 pence is obtained, or 2*d*. per tree as mentioned before. This method is fairly cheap, easy to apply and of assured efficacity.

SOUTH (F. W.). **Agricultural Pests Enactment no. 13 of 1913.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 8, March 1914, pp. 203-207.

The author deals with the necessity for such an enactment in the Malay States, since by far the greater portion of the cultivated area in the country is planted with one permanent crop only, in which a large amount of capital has been sunk. An important contributory factor to the danger of pests developing to a serious extent is the presence among large estates of a great number of small native holdings which are often greatly neglected, the pests being ignored unless treatment is insisted upon. The enactment provides for the appointment of inspectors of districts who will report the occurrence of diseases or pests to the Mycologist and the Entomologist of the Agricultural Department. The importance of ascertaining beforehand the life-histories of all potential insect pests is emphasised.

MOKRZECKI (S. A.). **О вредной для хлѣбовъ гусеницѣ стеблевой совки и о мѣрахъ борьбы съ нею.** [The caterpillar of *Oria* (*Tapinostola*) *musculosa*, Hb., as a pest of grain crops, and on methods of fighting it.]—*Published by the Zemstvo of the Govt. of Ekaterinoslav.* 2nd enlarged Edn., 1914, 8 pp., 2 figs.

This is a popular pamphlet giving information concerning the Noctuid moth, *Oria musculosa*, Hb., and the chief methods of controlling it. The author describes and figures the damage done to young cereals, which causes the middle leaves of the plants to turn

yellow and dry up. The caterpillars enter the plant through a hole gnawed in the stalk, and as they pass from one plant to another they are capable of destroying large areas of crops. Later on they attack the ear itself while still within its sheath.

The insect hibernates in the egg stage, the caterpillars appearing in the following spring and damaging the crops till about the end of June, when they pupate in the earth at a depth of about 2 inches; on pulling up injured plants the pupae may often be found in the earth attached to the roots. In the first half of July or later, the moths appear, flying in swarms at night and ovipositing on the stalks of grain, stubbles, and various weeds. The eggs are usually laid between the stalk and the leaf in which it is enclosed; each female may deposit up to 250 eggs.

*Oria musculosa* injures both winter and summer-sown cereals, but does not attack maize, sorghum, millet, lucerne, flax, potatoes, or bachza-plants. In 1894–1896, it did enormous damage to crops in the governments of Taurida, Ekaterinoslav, Cherson and in the provinces of Kuban and the Don. In 1912, the insects attacked some 125,000 acres of crops in the government of Ekaterinoslav and totally destroyed 54,000 acres. In 1913, the damage was still greater and as this pest appears in several successive years, it may play havoc with the crops again this year.

The author recommends as preventive measures, the rotation of crops and the destruction of weeds and generally keeping the fields clean. For the destruction of the insects, he recommends ploughing the fields in autumn to a depth of about 7 inches, taking care also to plough up the stubble and weeds and to burn both after the harvest. If no remedies have been applied in autumn and the caterpillars have attacked the crops in spring, it is recommended to pasture cattle on such fields or to cut the crop at once and to replant the land with another crop which is not liable to attack. When the injuries have been noticed only at the time of earing, the crop must be cut and the field reploughed not later than the second half of June; by this means the pupae will be buried so deeply that the emerging imago will not be able to escape from the earth. The author states that the pests have been got rid of in the government of Taurida by these methods.

THOMAS (W. A.). **The Cotton Root Louse** (*Aphis maidis radicis*).—*S. Carolina Agric. Expt. Sta., Clemson College, Bull.* 175, March 1914, 4 pp.

This is a brief preliminary account of the insect; a complete separate bulletin covering 3 years' work in co-operation with the section of Southern field experiment of the U.S. Bureau of Entomology is now in preparation. The author remarks that last season was very favourable for the development of this pest, which occurs throughout South Carolina, being especially troublesome in coastal counties. It is easily recognised by its position on the roots of the plant and its bluish colour. On examining the roots for lice, the plant should be prized up with some tool inserted about 2 inches from the base of the plant and at such an angle that it will pass under the tap root, the earth will fall away leaving the lice exposed on the root, and it should be remembered that when exposed they will leave the plant.

If the plant is pulled directly from the soil the lice will remain in the ground, being stripped from the roots. Infested plants are easily recognised by their stunted and wilted appearance, as the lice suck the juices from the young tap roots. Ants are responsible for the spreading of this pest and they consequently must be looked on as enemies instead of friends. As a temporary control measure it is advisable to carry out a system of shallow cultivation in spring when the ants are first noticed to be excavating about the young plants, and this should be repeated every week during dry weather and as soon as the soil will permit after rain. Thus the ants are thoroughly disorganised and are prevented from nursing the cotton root louse. This process should be kept up until the soil is in a good growing condition and the cotton thoroughly established. The best permanent control measure yet found is a carefully planned system of rotation of at least 3 years' duration ; cotton should not follow cotton or maize, but a crop of small grain and cowpea hay should precede the crop on badly infested lands. Judge C. A. Woods, at Marion, has used the following rotation with marked success :—Maize followed by oats and cowpea hay, followed by cotton in the third year, and this in 5 years has reduced a bad infestation to practically nothing. It is of great value to have a winter cover crop upon the infested land at all times and so prevent the winter food-plants of this louse growing upon it. So far repellents have been of little value as remedial measures. This is especially true of tobacco products, which have been carefully investigated under varying conditions at the Marion laboratory. Some of the products used in the experiment were "nicotocide," "nicofume" liquid, rose leaf, tobacco dust, etc. The latter seemed to have no deterrent effect on either the root lice or their attendant ants, especially in field experiments where the ants have been known to burrow through 1½ inches of fresh tobacco-dust in constructing their nests—with no injury. Further experiments with cultural methods are now in progress.

Britton (W. E.). **The Brown-Tail Moth.**—*Connecticut Agric. Expt. Sta., New Haven, Bull.* 182, March 1914, 25 pp., 16 figs.

The purpose of this bulletin is to give a brief summary of the information that has been accumulated concerning this pest. Up to date (February 1914) the brown-tail moth has spread over the following territory :—The southern part of Maine and about 3,000 square miles in Nova Scotia and 6,000 square miles in New Brunswick ; the whole of New Hampshire, except a few northern towns in upper Coos county ; western half of Vermont, except possibly a few towns in Essex and Orleans counties on the northern border ; nearly all Massachusetts, except a part of Berkshire county, a few adjoining towns and the whole of Rhode Island ; about one-third of Connecticut, including Windham and Tolland counties and a portion of Hartford and New London counties ; and this winter, nests have been found on Fishers Island which belongs to the State of New York. Evidence shows that the pest has spread more rapidly in the north and east direction than in the south and west, the chief reason for this probably being the prevailing winds in summer. Further details are given of the spread in Connecticut in spite of all efforts. Food-plants are numerous, Fernald and

Kirkland having given a list of about 80 species in 1903. Pear, apple, stone fruits, oak, maple and elm seem to be the chief ones attacked. Details of the life-history are given.

*Entomophthora* (*Empusa*) *aulicae*, Reichardt, attacks the caterpillars, killing in damp seasons perhaps 60 per cent., but in dry seasons very few, its effect being greatest in bad infestations. There are few native insect parasites which will attack the pest; among birds, cuckoos feed on the caterpillars and many kinds devour the moths, but these native enemies cannot hold it in check. Among the imported parasites, two egg-parasites *Telenomus phalaenarum*, Nees., and a species of *Trichogramma* are mentioned as having been colonised, but are apparently of little value. From hibernating caterpillars three hymenopterous parasites, *Pteromalus egregius*, Först., *Apanteles lacteicolor*, Vier., and *Meteorus versicolor*, Wesm., and a Tachinid, *Zygobothria nidicola*, Towns., were reared and colonised and are now firmly established. Several Tachinid flies were found to attack the larger caterpillars and among them *Compsilura concinnata*, Mg., is now established and of some value. Several predatory beetles were introduced and *Calosoma sycophanta*, L., promises to be of considerable value.

Control measures include spraying the foliage about 1st August, so that the young caterpillars will be killed as soon as they begin to feed on the leaves. This should not be done where the fruit will ripen shortly; lead arsenate is the best spray. During the winter, all trees should be examined for the nests, which should be removed and burnt at once. This is not practicable in forest lands, as the beech and oak trees hold their leaves. As the moths are attracted by lights they gather in settled communities, and combined efforts are therefore necessary for good results. State laws in Massachusetts and New Hampshire require each property owner before a certain time to remove the winter nests from the trees on his grounds; if left undone, the town authorities must do the work at his expense. Should the municipal authorities neglect park and highway trees, the State authorities may order the collection of nests to be done at the expense of the town. The author remarks that similar legislation will soon be necessary in Connecticut as the pest will doubtless gradually cover the entire State. One-third is at present infested, and scouting and removing of nests cannot be continued over the entire area.

JERMAKOV (E. P.). **Вредъ, приносимый муравьями въ садоводствѣ.** [The damage caused by ants in orchards.]—**« Прогрессивное Садоводство и Огородничество.»** [*Progressive Fruit-growing and Market-Gardening*,] *St. Petersburg*, no. 18, 17th May 1914, pp. 557–559.

The author refers to the well known damage done by ants in fostering aphids, and suggests that the real reason why some fruit trees perish from frost is that their roots are damaged by aphids. He has destroyed large numbers of ants in his orchard and did not use any protective remedies against frost, but nevertheless all the trees were able to stand the winter satisfactorily. He draws the attention of experts to the necessity of finding some effective means of eradicating ants. He has experimented with what he calls meat-bone meal, prepared from the

carcases of oxen not fit for consumption, which he used as a manure. He made an infusion of this meal, about ½ lb. of meal being added to 5 gallons of water and left for a few days to infuse. When he poured this water over ant hills he noticed that it killed the insects, but owing to the depth to which the nests extend below the surface it was not possible to reach all the ants. He has also watered the earth about the roots with the same infusion and found that the trees recovered and gave a fairly good yield, while the number of aphids diminished.

VASSILIEV (E. M.). **2-oe дополненіе къ „ Списку животныхъ вредителей люцерны "**—[Second supplement to "The List of Animal Pests of Lucerne."] **« Хозяйство.»** [*Chosjaistvo*], *Kiev*, no. 16, 15th May 1914, pp. 537-539.

*Otiorrhynchus ligustici*, L., in the larval stage injures the roots of the plant; trapping in trenches containing wells or bait holes at intervals is the simplest remedy, as the beetles cannot fly and move slowly. *Lethrus apterus*, Laxm., according to V. Averin appeared in great numbers on some fields in the government of Charkov, eating maize, sunflower seeds and lucerne. [See this *Review*, Ser. A, i, p. 527.] *Thea 22-punctata*, L., which is given by Professor Kirchner as a pest of leaves of lucerne must be excluded from the list according to Martelli, to whose work, as abstracted in this *Review* (Ser. A, ii, p. 150), the author refers. *Sitones lineatus*, L., has caused injury to the tips of leaves of lucerne in March of this year at the Station in Smiela. *Sitones humeralis*, Steph., is recorded by Grandi as injuring the roots of various species of lucerne. *Sciaphobus squalidus*, Gyl., damages leaves of lucerne, as reported by Znamensky. The larvae of *Phlyctaenodes sticticalis*, L., are noted by Averin as attacking the leaves of lucerne in the government of Charkov.

The author mentions that Lefroy recommends for spraying an emulsion of naphthalin, glue, soap and kerosene in order to avoid poisoning the crop by the use of arsenicals.

IMMS (A. D.). **The Scope and Aims of Applied Entomology.**—*Parasitology, Cambridge*, vii, no. 1, May 1914, pp. 69-87.

A generalised review of the whole subject, which the author subdivides into medical, agricultural and economic entomology, restricting the last term to the study of insects injurious to household or manufactured goods.

VUILLET (A.) **La Thripsose de Pois.** [Thrips attacks on Peas.]—*Revue Scientifique, Paris*, 16th May 1914, pp. 626-627.

The injury done by thrips to peas may cause the failure of the crop. The species particularly harmful to these plants is *Frankliniella robusta*, which is probably identical with *Thrips pisivora*, described as injuring peas in the neighbourhood of Oxford. This species was not recognised in France until 1913, when it was found at the Agricultural College at Chesnoy, near Montargis. Three crops in succession were ruined; the thrips enter the young flowers and leaves

when they are still in the bud and cause malformation and often destruction of the shoots, and sterility in the flowers.

A hymenopterous parasite of *F. robusta* has been found at Dercy, but not at Chesnoy. This species, *Thripoctenus brui*, is one of the only three internal parasites of thrips that are known. The author suggests introducing this parasite into Chesnoy. A method of artificial control has been tried in England by Theobald with good results ; it consists of applying a soap solution containing powdered pyrethrum in suspension to the affected plants. Sowing the same crop on ground that has borne an infested crop should be avoided, and if possible the same crop should not even be sown in adjacent fields. Care should also be taken that the ground on which the new crop is to be sown is not contaminated with thrips by the use of supporting sticks from infested fields ; if the infestation is very severe, the only method is to burn the entire crop.

VUILLET (A.). **Les Pucerons du Sorgho au Soudan français.** [The millet aphids in the French Sudan.]—*Revue Scientifique, Paris*, 2nd May 1914, pp. 563-564.

The cultivation of millet (*Sorghum vulgare*) is of considerable economic importance in the French Sudan, a failure in the crop being nothing short of a calamity for the inhabitants. Failure may be due either to too dry weather, or more commonly to the attack of *Aphis sorghi*, Theo. This insect not only sucks the juices of the millet, but secretes a sticky substance that serves as a substratum for the growth of certain fungi, which by covering the leaves, stops the respiration and assimilation of the plant. The species can maintain itself in an active state throughout the year.

Fortunately, *Aphis sorghi* is subject to the attack of numerous natural enemies. Among these are the Coccinellids, *Chilomenes vicina*, Muls., *Exochomus flavipes* v. *troberti*, Muls., and *Scymnus plebejus*, Weise, the larvae and adults of which prey on *A. sorghi* ; the larvae of the Syrphids, *Paragus longiventris*, Loew, *P. serratus*, F., *P. borbonicus*, Macq., *Xanthogramma aegyptium*, Wied., and *Leucopis* sp. ; and *Chrysopa ouilleti*, Nav., *C. incongrua*, Nav. and *C. oralis*, Nav.

Millet is attacked in the French Soudan by yet another species of *Aphis*, namely *A. maidis*, which is widely distributed in the United States, Australia and Japan. This species, which is called the green Aphis to distinguish it from *A. sorghi* which is known as the white Aphis, is found on the ends of the leaves of millet and maize, and on the male inflorescences of the latter. It is much less harmful than *A. sorghi*.

The chief method of controlling these insects is to dig up and burn all the infested plants before the beginning of February : this is now compulsory by law. To encourage the natural enemies of the Aphids, a few plants of *Leptadenia lancifera* should be allowed to grow at intervals in the millet crops, as this plant is frequented by most of the Coleoptera and Diptera which are predaceous on the Aphids.

Marchal (P.). **Rapport phytopathologique pour l'année 1912.** [Report on injurious insects in France in 1912.] *Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 1-9. [Received 18th Feb. 1914.]

An abstract of this report was published in this *Review*, Series A, i, pp. 226–229.

Marchal (P.). **L'*Icerya purchasi* en France et l'acclimatation de son ennemi d'origine australienne le *Novius cardinalis*.** [*Icerya purchasi* in France and the acclimatisation of its Australian enemy, *Novius cardinalis*.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 13-26, 5 figs, 1 pl. [Received 18th Feb. 1914.]

The information given here was abstracted in this *Review*, Series A, i, p. 392. Two detailed descriptive and technical notes on *Icerya* and *Novius* are now included.

Poirault (G.) & Vuillet (A.). **L'acclimatation du *Novius cardinalis* dans les jardins de la presqu'île du Cap Ferrat envahis par l'*Icerya purchasi*.** [The acclimatisation of *Novius cardinalis* in the gardens of the Cap Ferrat peninsula infected by *Icerya purchasi*.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 27-33, 4 figs. [Received 18th Feb. 1914.]

In breeding the Coccinellid a meat-safe was first used, the wire-gauze sides of which were covered with a rather fine muslin. With this box there was some difficulty in inspecting the insects, and a special one was then made with sides partly of clear glass, partly of wire-gauze, and with a hinged lid at the top. A large bag of tulle with room for both the box and the operator permitted of all manipulations being effected without any danger of the imagines escaping. Illustrations of the apparatus are given. In an open cardboard box containing remnants of *Icerya*, eggs, larvae, nymphs and adults of *Novius* were placed and the box fixed to a lemon tree infested by the Coccid. This proved successful, but later, open tubes of wire gauze containing at least one hundred *Novius* were attached to the branches of infested trees and the results were even more satisfactory. [See this *Review*, Ser. A, i, p. 171.]

Vuillet (A.). **Protection des plantes cultivées contre les insectes d'origine exotique.** [The protection of cultivated plants against exotic insects.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 34-50. [Received 18th Feb. 1914.]

To prevent the introduction of injurious insects with imported plants, etc., the following measures are recommended: (1) Inspection of the crops of the exporting country, if possible, when growing. The official entomologists of the importing country should have full information on this point. (2) Certificates of phytopathological inspection. It may be enacted that all plant shipments be accom-

panied by a certificate issued by a competent entomologist who has inspected the shipment in question and found it free from pests. (3) Fumigation certificates. These offer more ample security than the former, but should not lead to all other precautions being discarded, for even when properly effected, fumigation is not always a certain guarantee of the destruction of all pests. (4) Inspection of shipments at destination. This method may be considered to be the most efficacious. It is essential, however, that commerce be as little disturbed as possible and a very perfect organisation of personnel and equipment is therefore necessary in the plant inspection station. In Europe, the station for plant protection at Hamburg may be regarded as a model. (5) Fumigation on arrival. The security afforded by inspection is doubled by submitting the plants to disinfection. (6) Quarantine. Some plants and some parasites can only be efficaciously dealt with by quarantining them. Quarantine may also be resorted to where the success of fumigation is doubtful. (7) Prohibition. As the application of the foregoing measures requires a special organisation and a technical staff which all countries do not possess, it sometimes becomes necessary to prohibit the importation of one or more species of plants from a given country of origin. It is a measure possessing little practical value. Even where the prohibition is limited, commerce is gravely interfered with.

The author considers the following to be an ideal system of protection against the importation of exotic pests :—Inspection on arrival, carried out by a fully competent staff and supplemented by certificates, fumigation and quarantine. Since in spite of every precaution, infection is always possible, it sometimes becomes necessary to stamp out the pest. This is only where the infection is confined to a limited area. When it is found impossible to check the pest its surroundings may be rendered unfavourable to it by cultural methods and by increasing the powers of resistance of the plant attacked.

Roux (E.). **Note sur la nécessité de l'emploi des substances vénéneuses, et notamment de l'arséniate de plomb, en agriculture.** [The necessity of the use of poisons in agriculture, particularly of arsenate of lead.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 51-56. [Received 18th Feb. 1914.]

A proof of the accepted value of arsenicals in insect pest control is furnished by the fact that in 1911 the Department of Hérault alone used 300 tons of arsenical compounds. These products are costly and there must be good reason for the expenditure incurred. The analysis of grapes, wines and vintage pressings, collected from all parts of the vine-growing districts, in September 1911, after an exceptionally dry summer, in the course of which the arsenate had not been washed away by rain, showed that traces of the poison were only present in the pressings and grapes. This, too, only in cases where the arsenate had been applied on formed grapes in direct violation of the regulations. These results lead to the conclusion that considerable quantities of lead arsenate may be used with impunity.

Marchal (P.). **Opportunité de l'emploi des arsenicaux, et en particulier de l'arséniate de plomb, en agriculture.** [Facilities for the use of arsenicals, particularly lead arsenate, in agriculture.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 57-62. [Received Feb. 18th, 1914.]

The prohibition of the use of lead arsenate would deprive agriculture of an efficacious insecticide which cannot, at present, be replaced in many cases. As regards its toxic properties, lead arsenate is relatively non-poisonous compared with sodium arsenate and, particularly, sodium arsenite. This is easily explained by its lower solubility. If lead arsenate be supplied to agriculturists in the form of a ready-made paste its use should not cause any real alarm. The author refers at length to the experiments conducted by M. Fabre, and it is worthy of note that only once was a definite case of arsenic poisoning observed by him. In this case the great quantity of poison (17 milligrammes =9 of metallic arsenic) found in the wine concerned excludes an insecticide as the cause, and it was probably due to some mistake, such as the storage of the wine in containers used for arsenicals. Even in the case mentioned the poisonous effects were not caused by lead arsenate, for no trace of lead could be found and the agent was probably an arsenical anhydride, sodium arsenate or sodium arsenite.

A letter received from Mr. Quaintance on the subject is annexed to this paper in which he says that arsenicals are really necessary in agriculture; lead arsenate is superior to all others as an insecticide, in that it is effective, adheres well and does not burn the foliage. So far as his knowledge goes, no case of poisoning following the eating of fruit or other produce treated with arsenicals has occurred in the U.S.A., though in gipsy moth areas, a few animals have been poisoned by eating grass which had been fouled by the dripping of arsenical sprays from the trees. This compound has largely replaced all other arsenicals in orchards and vineyards in the United States.

Fabre (H.). **Essais sur les toxicités de quelques composés arsenicaux utilisés en agriculture.** [Experiments on the poison strengths of some arsenical compounds used in agriculture.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 63-76. [Received 18th Feb. 1914.]

The author likens the toxic properties of arsenicals to those of the cuprous salts, against which so much was said when they were first introduced about 1884 and of which thousands of tons are now used annually without ill effects. The rules laid down when arsenicals were first introduced should, however, be rigidly observed, especially those requiring workmen to don a special suit when spraying, to wash both hands and face before a meal, to abstain from smoking when at work and to use specially marked buckets, etc., for the insecticide. The results obtained by the author are shown in a number of detailed tables. The equivalent fatal doses of metallic arsenic per 100 grammes weight of rabbit are:—Lead arsenate 3 milligrammes, sodium arsenate 2 mg., arsenic anhydride 1·5 mg., sodium arsenite 0·5 mg. If arsenic compounds are used the doses are: Lead arsenate paste 35·8 milligrammes, anhydrous sodium arsenate 4·96 mg., pure arsenic anhydride

1·98 mg., dry sodium arsenite 1·28 mg. These figures show the comparative risk incurred when handling arsenicals in the form in which the agriculturist receives them. Lead arsenate is the least dangerous, particularly if prepared in the form of paste. Winter insecticides (sodium arsenite) would be about 102 times as poisonous as spring insecticides (lead arsenate), if the winter insecticide (a commercial solution) tested by the author may be taken as representative and the effect of the poison be the same on man as on rabbits. In a supplement to this paper the author reports on an experiment he made with a view to establishing whether dangerous traces of poison are present on the edible portions of vegetables sprayed with arsenicals. The tests were made with specially sprayed asparagus. A bundle of 35 heads, sufficient for several people, only contained 1·1 milligramme of arsenic. It should be noted that these plants were sprayed much more heavily than in normal practice. It is pointed out that asparagus and most other vegetables contain some thousandths of a milligramme of arsenic and the few hundredths of a milligramme accidentally left on them by spray treatment on adjacent vines can do no harm, as a dose about 10,000 times as large was necessary to cause appreciable ill effects in rabbits.

PICARD (F.) **Considérations sur l'emploi des arsenicaux dans la région méridionale.** [The employment of arsenicals in the South of France.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 76-79. [Received 18th Feb. 1914.]

Spring treatment with lead arsenate especially aims at combating *Clysia* and *Polychrosis*. Lead arsenate is also the only insecticide at present used against two beetles which are abundant in the South and recurrent every year, *Haltica* and *Rhynchites*. The former is by far the more dangerous and lead arsenate has alone made control of it possible. In the case of *Rhynchites* also it does not seem feasible to replace lead arsenate by another insecticide. It is not quite successful with *Clysia*, but neither are other insecticides. Winter treatment is practised with sodium arsenite, either by itself or compounded with other substances of little insecticidal value, but in the author's opinion, it is not an efficacious remedy and had better be abandoned, particularly as cases of poisoning through its use are not unknown. No authentic case of poisoning has been recorded in the use of lead arsenate.

PICARD (F.). **La teigne des pommes de terre.** (*Phthorimaea operculella*). [The potato tuber moth.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 106-176, 23 figs. [Received 18th Feb. 1914.]

The author deals very fully with the biology of *Phthorimaea operculella*, Z. (*Lita solanella*, Rag.) on the potato, and points out that when the larvae are full fed, they generally emerge from the tuber and try to ascend as far as possible in order to spin their cocoons. The whole development progresses more quickly as warmth increases, but the lower limit of temperature at which growth is interrupted, was not exactly ascertained owing to lack of equipment; apparently neither hatching nor larval growth was observable under 50° Fahr.

At high temperatures all stages were greatly accelerated, being consequently of smaller size than those of which the development had been less hurried. The author believes 6 generations to be possible in the South of France under normal conditions. The possibility of the insect being introduced into the North of France is not very serious, and the damage done there will evidently be of a less severe character. The author also deals with parthogenesis in this insect. [See this *Review*, Ser. A, i, p. 166.] Solanaceous plants on which this insect occurs, other than the potato, are :—*Solanum maglia*, *S. commersoni*, *S. dulcamara* (bittersweet), *S. miniatum* (red nightshade), *S. melongena* (egg-fruit), *S. lycopersicum* (tomato), *Capsicum annuum* (red pepper), *Nicotiana tabacum* and *N. sylvestris* (tobacco), *Hyoscyamus albus* (white henbane), *Lycium europaeum* (European boxthorn), and *Fabiana imbricata* (false heath). Other plants frequented are :—*Verbascum sinuatum* (mullein), *Cynoglossum pictum* (hound's-tongue), *Linaria vulgaris* (toad-flax), *Pyrus malus* (apple), and *Typha angustifolia* (small bulrush). Smooth surfaces are not suited for oviposition, which is only stimulated by uneveness in the surface of the host. The various Solanaceae all appear to possess the property of attracting the moth, but the potato is preferred to the others. The alimentary instinct of the larva is also determined in some measure by this matter of surface, but the two instincts are not completely correlated and the plants agreeable to the egg-laying female are not always those acceptable to the larva. This pest is very widely distributed, the following countries being specially mentioned :—United States, Australia, Tasmania, New Zealand, Cape Colony, British India, Algeria, France, Italy, Spain, Canary Islands and Azores. In France, the moth was at first confined to a narrow strip of coast in the Department of Var in the South, where it was first noticed near Cogolin, in 1906. The author believes it to have originally come from the American continent, or perhaps Tasmania or Australia, but a Mediterranean origin must be excluded. The chances of the insect being carried from Var to Britanny and Normandy are very small. No insect parasite of the moth is known as yet. The author experimented with fungi and though success was far from being complete with *Beauveria globulifera*, *B. bassiana* and *Spicaria farinosa*, the results were distinctly encouraging. A case of natural infection by *Beauveria effusa* also points to this fungus being of use. The author succeeded, though with difficulty, in infecting *Phthorimaea* larvae with *Nosema bombycis*. Attempts to infect the larvae with "grasserie" were but very moderately successful.

The author considers that as long as the habitat of the moth is confined to the area attacked in 1912, the principal measures to adopt are the immediate destruction of infested potatoes, the storage of sound ones under a layer of sand, and the disinfection of infected premises with petroleum or petroleum-soap emulsions. Experiments with lead arsenate appear to prove that it acts as an insectifuge on the adult and may entirely prevent oviposition, but that it does not harm the eggs and does not hinder the development of the larva. The use of insecticidal gases does not seem to present much hope of success. Light traps are useful in helping to keep the pest down, but cannot be a means of exterminating it. Control must be based on the use of a layer of sand to prevent the female from laying eggs on stored potatoes.

The thinnest layer gives complete protection. If, however, the tubers are already damaged the larvae will hatch out and work their way to the surface of the sand. This is of no great importance, as the resulting adults will not be able to cause injury and the loss will be limited. Boxes in which the tubers are stored under a layer of sand may have holes or cracks permitting the pest to enter, so that it is better to lay the tubers on the ground and cover them. Disinfection of the premises is absolutely necessary. Collection of the larvae is of very great use if practised in spring or summer, when the pest is not numerous.

Stems showing bore holes should be collected and burned before the larvae have time to escape. Cultural methods, care in the choice of clean seed and the destruction of all wild Solanaceae capable of affording food are very necessary measures. A bibliography of 48 works issued up to 1913 completes this paper.

Beauverie (J.). **Etude d'une maladie des pêchers dans la vallée du Rhône.** [A peach disease in the Rhône valley.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 186-195, 8 figs. [Received 18th Feb. 1914.]

The Ambrosia fungus which lines the galleries made by *Xyleborus dispar* is only an accompaniment of the injury which is due to the insect itself. The author has observed cases where the attack has proved fatal to trees of small diameter in the Rhône valley. The fungus favours the development of the beetle by extracting from the wood the nutritious matter contained in it, but could not, by itself, injure the plant. This the author has proved by inoculating young peach trees with fungus, the results being always negative. The trees attacked include the oak, beech, maple, hornbeam, alder, ash, plane, chestnut and fruit trees, such as the peach, cherry, pear and apricot. The insect also attacks the vine and, exceptionally, conifers. It prefers trees which are drooping or have been felled, but where such are lacking it attacks healthy individuals. In the Rhône valley, only trees of three years or older growth are injured.

As a preventive measure the burning of all old wood is necessary. Where the pest has actually appeared, all infested trees must be burned without delay. Besides this, plugging the entrance holes, or painting with sodium arsenate or with a mixture of lime, lysol, alcohol, nicotin and linseed oil may be tried, but these methods are of doubtful efficacy. Sticky bands or trap heaps have been advised. The latter are very useful if carefully watched and their contents burned at the proper time. Infested trees may also be utilised in this way. An important prophylactic measure consists in rational manuring, whereby the trees are kept in a flourishing and healthy condition, which repels the pest.

Gastine (G.). **La lutte contre la** ***Diaspis pentagona*** **en Italie.** [Mulberry scale control in Italy.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 196-219, 4 pls. [Received 18th Feb. 1914.]

Much of the information given here has been recorded in a booklet by the author [see this *Review*, Ser. A, ii, p. 123]. In the present paper instances of successful control of *Aulacaspis*

*pentagona* by *Prospaltella berlesei* are described in detail. During a special visit to Italy, the author found that in Venetia, control by the parasite had proved completely successful and exceedingly good results were obtained in Lombardy. In the colder region of Piedmont the services rendered by *Prospaltella* were beginning (Feb. 1913) to be appreciated, though not yet to the same degree as in Venetia. The results are, no doubt, less rapid in Piedmont. The very rapid diffusion of *A. pentagona* renders artificial control nearly impossible, while control by means of a parasite is general and permanent if the parasite be really efficacious.

LESNE (P.). **La mouche de l'asperge.** [The asparagus fly.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 228-247, 5 figs., 2 pls. [Received 18th Feb. 1914.]

The asparagus fly, *Platyparea poeciloptera*, Schrank, belongs to the MUSCIDAE. First described in 1776, it was observed doing injury in Germany by Bouché (1847) and then in Austria by Loew (1862), Taschenberg (1866), Schmidt-Goebel (1881) and Bolle (1900). In France the extensive damage done at Argenteuil was noticed by Giard in 1903, and at present it occurs over a large area around Paris, appearing towards the middle of April. Adults continue to emerge from winter pupae until early in July, males slightly outnumbering females. The flight is heavy and far less swift than that of other MUSCIDAE. The female has a sword-shaped ovipositor with which she punctures the asparagus "head" about an inch from its tip and just beneath a bud. The egg being laid, the female turns round and sucks the exuding sap before laying another egg elsewhere. She does not always deposit an egg in the puncture, but never fails to suck the sap. The author has observed a captive female make 55 punctures in 24 hours on 3 heads of freshly cut asparagus. The egg generally lies at a depth of $\frac{1}{2}$ to 1 mm.; occasionally it is laid outside the puncture and does not then hatch. Heads just emerging from the soil and those 4 to 6 inches high are equally attacked, less often those 20 inches high. Up to 60 eggs have been found in one female, but this is a minimum figure as the ovaries also contained many ovules in the course of development. At a mean temperature of 58°–60° Fahr. the embryo develops in 60 to 70 hours, while at about 69° Fahr. 48 hours are sufficient. The larva are of the usual Muscid character and were noticed in the beds up to the third week in July. Pupation begins toward the end of June; about the 25th June the larvae were still in the majority, but by the 5th of July the pupae were more numerous. *Platyparea* has only one annual generation and passes at least 10 months in the pupal state. The young larvae bore vertical galleries down the stem a little beneath the surface, which soon discolour. This discoloration is followed by a grey or brown cicatrice, which impedes the growth of the stem on that side and causes it to curve, thus indicating the presence of the insect. The larvae have by then consumed the greater portion of the tissues. The gallery occasionally goes down to the root, but never penetrates it. The larva then ascends without making a new gallery until it is a little above the soil. It then excavates a passage to the surface of the stem, but leaving

the epidermis, through which the adult eventually emerges. This membrane is easily visible on the stem, when above the soil. It is grey or brown in colour, from $2\frac{1}{2}$ to 10 mm. long and 2 to 4 mm. wide. Having made these preparations the larva descends again and generally pupates head upwards. The depth of the galleries, the point where pupation takes place and the position of the exit aperture are most important factors in control. The author gives 6 detailed tables of the results of his observations. The distance between the orifice of the gallery and the point where the pupa is fixed varies between $1\frac{1}{4}$ and $4\frac{1}{2}$ inches ; pupation generally takes place at from 2 to 5 inches below the surface of the soil, and very rarely a little above the level of the soil. Thin asparagus stems are usually immune ; one-year-old plants are therefore seldom attacked, those of two years' growth suffering most. In 1904 and 1905, two-year-old asparagus plantations at Epinay were destroyed to the extent of one-half or even three-fifths, and many growers abandoned its cultivation. Heavy or prolonged rains cause many adult flies to disappear, as they can get no adequate shelter. Cold seems fatal to the eggs, since on the 16th May 1909 the author found the embryos dead in eggs from heads collected that same morning at Argenteuil, slight frosts having occurred during the preceding nights.

In 1903, Giard reported the presence of a Geophilid in stems attacked by *Platyparea* larvae, but the author has never observed the latter to be attacked. In the Argenteuil district, parasites appear to be rare. The author was able to breed only one, a Braconid, and then only obtained two females, which emerged in April 1911. This *Bracon* is nearly allied to *B. satanas*, Wesmael, and may be a form of it. When the *Platyparea* larvae are too numerous in a given stem, food fails them and they devour one another ; they also attack each other when they meet in the mines, even when food is abundant.

The burning of dead stems in winter, which was formerly prescribed, does not destroy all the pupae, because the rapid decomposition of the thinner heads allows many pupae to subsist in the soil where winter treatment cannot reach them. The only suitable moment for destroying the insects is when the heads show the first signs of injury. They should then be detached from the root, rather than cut, since the larva may descend as far as the point where the stem is inserted into the root. The decomposition which some stems undergo makes it impossible to pull them up, and the pupae underground escape destruction, though this might be obviated if the injured stems were removed at the end of the season when they are cut about 4 to 8 inches above the soil. Any injury is then clearly visible, as the galleries appear as circular holes about 2 millimetres in diameter. The burning of the bases of the stems (cotons) as now practised in the field is often incomplete, and the author has frequently picked up stems carbonised at one end and containing living pupae at the other. Better results would be obtained if the growers were to bring the " cotons " to a specified shed where they might be dried and completely burnt. Abandoned asparagus beds constitute a centre of infection and should be cleared. The author gives a map and list of infected localities. The fly prefers protected slopes with a south aspect. A bibliography of 15 works (1776–1909) concludes the paper.

PICARD (F.). **Rapport sur la Cochylis et l'Eudémis dans le Midi de la France.** [Report on *Clysia* and *Polychrosis* in the South of France.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 352-364. [Received 18th Feb. 1914.]

It is certain that the disappearance of *Clysia ambiguella* has favoured the tendency of *Polychrosis botrana* to spread. Experiments made to determine the action of heat on the winter pupa, showed that *Polychrosis* cocoons submitted to a temperature of 79°–82° Fahr. produced adults about 4 months before the normal time. The author noticed *Polychrosis* on *Arbutus unedo* and on *Daphne gnidium*, both of which seem very suitable food-plants, especially the former. It was also found on *Zizyphus vulgaris*, which appears to excite the silk producing glands, for the cocoons were about twice the size of those found on the vine, though of the same texture. The carnivorous Acarid *Pediculoides ventricosus* speedily kills both *Clysia* and *Polychrosis* larvae and seems suitable for use against the first generation when protecting vine-arbours or a limited number of stocks. Parasitic fungi were tried without success. Attempts to infect *Polychrosis* with micro-organisms, those of "pébrine" and "grasserie" were successful, but infection was difficult to bring about and lacked virulence. In the course of experiments with various methods of winter treatment, proof was obtained that the newly hatched moth is nearly always incapable of passing through a layer of light earth or fine sand two-fifths of an inch thick. A compact soil, more or less clayey, must therefore be quite impassable. Submersion is efficacious when the entire stock, or the greater part of it, can be placed under water. Where big branches emerge, submersion is not efficacious, and may sometimes prove injurious, for the pupae located on the emerging branches are favoured by the dampness of the soil. This may be avoided by decorticating the branches above the water-line as soon as the surrounding soil permits. Submersion may, however, be bad from another point of view: *Cacoecia costana* (the *geflammte Traubenwickler* of the Germans) which is omnivorous and attracted by moisture, is compelled by submersion to resort to the vine, as other low-lying food-plants are under water. Watering the vineyards is a practice which cannot be dispensed with in the South of France, but *Clysia* moths concentrate on vineyards which have been watered and damage them to a very noticeable extent. The only plan is to delay watering as much as possible and ascertain first that the flight of the moths has finished. This may be done by setting a few light traps. Too prolonged a delay may be dangerous, as then the watering might coincide with the third *Polychrosis* flight. The author did not obtain good results with either bait or light traps, though it was shown that more females are attracted by bait and more males by light. Spring insecticide treatment was incomplete, but showed that both lead arsenate and sodium arsenate are of use. The latter substance, at a strength of 1 per 1,000 in water, does not cause injury to the plants and appears quite as efficacious as lead arsenate. Summer insecticide treatment was carried out on a larger scale. None of the products tested gave satisfaction, though lead arsenate and sodium arsenate showed an efficiency of about 50 per cent. and the latter at a strength of 1 per 1,000 proved no less efficacious than the former.

Börner (C.). **Blattlausstudien.** [Studies of Plant Lice.]—*Abhand. Naturwiss. Ver., Bremen*, xxiii, pt. 1, 1914, pp. 164-184, 4 figs.

After giving a summary of the known facts as to the migration from one host to another of 57 species of Aphids, the author records the habits of several species of which he has himself worked out the life-history and studied the migrations.

*Aphis* (*Brachycaudus*) *pruni*, Koch, was observed in the neighbourhood of Metz; in the spring they were found in large numbers on *Prunus domestica* and *P. institia*, more rarely on *P. spinosa*, and they cause the leaves of these trees to curl up and fall off. The individuals found on *Prunus* in the spring are the wingless females (stem-mothers); they give rise parthenogenetically to winged individuals which leave the original host-plant and fly to various wild plants, in May and June. In August, winged individuals appear in large numbers; they are produced parthenogenetically and consist of both males and females; they return to *Prunus*, on which the eggs are laid, before winter sets in.

*Aphis piri*, Boyer, was common in the neighbourhood of Metz in the summer of 1913. From May onwards, wingless females were found on the underside of the leaves of apple-trees; the first generation to which these give rise are wingless individuals; the individuals of the second generation are winged; these leave the apple-trees in July and were found in August on the roots of *Rumex* (dock). Winged males and females were produced on this host-plant; the latter migrated to the apple, where another generation of females was produced; these were joined by the mature males and fertilised, the eggs being laid in the buds and on the cortex of the twigs. *A. piri*, Boyer, is distinct from *A. piri*, Koch, which lives partly on the pear and partly on coltsfoot.

*Aphis grossulariae*, Kalt., infests red currants and gooseberries. Numerous wingless individuals were found late in May; the stem-mother which had given rise to these was apparently winged, but this was not determined with certainty. Later, winged individuals appeared which migrated from *Ribes*; the second host plant was not found, nor did the lice appear on *Ribes* again in the autumn in order to oviposit.

*Macrosiphum cereale*, Kalt., the corn louse, was traced to the blackberry; in spring the stem-mother was found on the blackberry and also its offspring, which consisted of winged and wingless individuals; the winged forms migrated to various grasses where they gave rise parthenogenetically to winged males and females; these returned to the blackberry, where another generation of females was produced parthenogenetically, these being the true females. The eggs were laid in the buds and on the twigs of the blackberry The author confirms Mordwilko's suggestion that *Schizoneura piri* is the true female of *S. lanuginosa*. *Schizoneura ulmi* was found by the author on *Ribes rubrum*, *nigrum*, *grossularia*, *alpinum*, and *aureum*. The migrations of the following species of less economic importance are described: *Aphis rumicis*, *Siphocoryne saliceti*, *Rhopalosiphum lonicerae*, *Hamamelistes betulinus* and *Tullgrenia phaseoli*.

## NOTICES OF ENTOMOLOGICAL APPOINTMENTS, &c.

**The Canadian Entomological Service.**

Thirty years ago, in 1884, the Canadian Government appointed a Dominion Entomologist to advise agriculturists and others regarding the control of insect pests. Two years later, on the establishment of the Experimental Farms system, Dr. James Fletcher who occupied the position, was attached to the new Branch of the Department of Agriculture in the joint capacity of Entomologist and Botanist, which position he occupied with conspicuous success until his death in 1908. The growth in importance of the two subjects necessitated their separation and accordingly Divisions of Entomology and Botany were created. Dr. C. Gordon Hewitt was appointed Dominion Entomologist in 1909 and entrusted with the work of organising the new Division of Entomology of the Experimental Farms Branch of the Department of Agriculture, with offices and laboratory at the Central Experimental Farm, Ottawa.

The urgent need of legislation in order to permit action to be taken to prevent the introduction into Canada and spread within the country of serious insect pests and plant diseases was responsible for the passage of the Destructive Insect and Pest Act in 1910. The still greater need of investigations on the insect pests affecting agriculture, forestry and other branches of human activity has led to the establishment of field or regional laboratories in different parts of Canada with trained Entomologists in charge to study the local problems.

Owing to the consequent expansion of the Entomological work along investigatory and administrative lines and the fact that such work did not constitute a necessary part of the work of the Experimental Farms system and executively was virtually distinct, the Entomological Service has now been separated from the Experimental Farms Branch and has been constituted an independent Branch of the Department of Agriculture under the direction of the Dominion Entomologist. It is proposed to erect a building to provide offices and laboratories for the new Entomological Branch. Will correspondents kindly note that all official communications and publications should be addressed to "The Dominion Entomologist, Department of Agriculture, Ottawa."

This reorganisation, which will also include the establishment of a national collection of the insects of Canada in the Canadian National Museum (the Victoria Memorial Museum) at Ottawa, under the care of the Dominion Entomologist, marks an important step in Canadian entomology. It will result in a still greater development of the study of Canadian insects along scientific and practical lines.

The present organisation of the Entomological Branch of the Canadian Department of Agriculture is as follows :—

*Dominion Entomologist and Chief* :—C. Gordon Hewitt, D.Sc., F.R.S.C.

*Chief Assistant Entomologist*:—Arthur Gibson.

*Assistant Entomologist in charge of Forest Insect Investigations* :—J. M. Swaine, M.Sc., B.S.A.

*Assistant Entomologist in charge of Fruit Insect Investigations* :—vacant.

*Field Officers in charge of Branch Laboratories* :—Field Officer for Forest Insect Investigations, R. N. Chrystal, B.Sc. ; G. E. Sanders,

B.S.A., Bridgetown, N.S.; J. D. Tothill, B.S.A., and L. S. McLaine, M.Sc., Fredericton, N.B.; C. E. Petch, B.S.A., Covery Hill, Que.; Wm. A. Ross, B.S.A., Vineland Station, Ont.; H. F. Hudson, B.S.A., Strathroy, Ont.; Norman Criddle, Treesband, Man.; E. H. Strickland, Lethbridge, Alta.; R. C. Treherne, B.S.A., Agassiz., B.C.

*Inspectors and Assistants*:—A. B. Baird, Fredericton, N.B.; J. Perrin, Halifax, N.S.; J. I. Beaulne, Ottawa.

*Artist Assistant*:—A. E. Kellett.

*Superintendents of Fumigation and Inspectors*:—H. E. Goold, St. John, N.B.; G. Manley, Niagara Falls, Ont.; A. K. Leith, Winnipeg, Man.; L. Paradis, St. Johns, Que.; C. Wright, Windsor, Ont.; T. R. Waddington, North Portal, Sask.

*Inspector of Indian Orchards*:—T. Wilson.

*Secretaries*:—J. A. Letourneau, Miss J. McInnes, J. M. Moloughney, Miss E. Read.

*Laboratory Assistant*:—H. S. Fleming.

---

Mr. Alfred E. Cameron, Board of Agriculture Scholar in Entomology of Manchester University, has taken up work in the United States, where he is temporarily attached to the Entomological Department of the New Jersey Agricultural Experiment Station, New Brunswick, New Jersey.

---

## LIBRARY NOTICE.

Efforts to complete volumes of some of the serial publications received in the Library of the Bureau have proved fruitless owing to certain numbers being out of print. The Bureau will be greatly indebted to readers who may be able to supply any of the following:—

## AVIS DE BIBLIOTHÈQUE.

L'épuisement de certaines livraisons de quelques publications periodiques a frustré les efforts faits pour en completer les volumes. Le Bureau sera très reconnaissant aux lecteurs qui pourraient lui envoyer une ou plusieures des livraisons indiquées ci-dessous:—

L'Apiculteur, Paris: 57e Année, No. 1, Janvier 1913.
Boletin del Ministerio de Agricultura, Buenos Aires: Tomo XV, Núm. 3, Abril 1913.
Bulletin, Dept. Agric., Trinidad: Vol. IX, Nos. 61 to 65, Vol. X, No. 68 & Index.
Jardinage, Versailles: No. 3, Décembre 1913.
Tropical Agriculturist, Peradeniya: Vol. XL, No. 4, April 1913.

---

All publications intended for the Library of the Bureau should be addressed:—

Imperial Bureau of Entomology,
27, Elvaston Place,
Queen's Gate,
London, S.W.

# NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

# CONTENTS.



(C37.)

## CONTENTS—*continued.*

VOL. II. Ser. A. Part 7.—pp. 337-408. JULY, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.




*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

PAILLOT (A.). **Observations sur la Cochylis et l'Eudémis en Bourgogne pendant l'année 1912.** [*Clysia* and *Polychrosis* in Burgundy during 1912.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 339-351. [Received 18th Feb. 1914.]

The larvae of these moths hatch out by night or in the evening; only in dark, damp weather were a few cases of hatching by day noticed. Wild plants not only supply food in some cases, but they may also play a protective rôle, especially where the first generation is concerned. At this period the vines have little foliage and the moths take refuge among other plants. In one instance a thick hedge which ran through a vineyard served as a shelter for many *Polychrosis* during the period of flight and it was observed that the adjoining vines were more injured than others. The discovery of pupae in sheltered places provided by spiders' webs, paper, etc., confirm the interesting results obtained by Jablonowski, who succeeded in nearly eradicating *Polychrosis* by combining the employment of the earthing up method with that of shelter traps (corrugated paper placed round the vine-stock before the caterpillars descend). Where *Polychrosis* abounds it is most advisable to remove all the bunches left on the stocks after the vintage and thus destroy many undeveloped larvae and pupae. *Clysia* caterpillars seem but little sensitive to variations of temperature, whereas with *Polychrosis* the larval stage is prolonged about 15 days after a marked fall in the thermometer. The distribution of both pests is also influenced by the nature of the vine-stocks. It has been noticed that the "Gamay blanc" and "Aligoté" varieties were infested by the caterpillars, while red varieties close by remained immune. The author found large quantities of *Polychrosis* cocoons among inhabited spiders' webs, so that spiders cannot be considered to be enemies of the pest. Owing to their solitary and secluded mode of life, *Clysia* and *Polychrosis* larvae appear to be well protected against infectious diseases, though cases of infection by microbes from allied species are not impossible. *Spicaria farinosa* var. *verticilloides* is the cryptogamic parasite most frequently met with in these insects. All the attempts to spread this disease proved unsuccessful and the negative results obtained by M. Marchal with this parasite are confirmed. Bait traps were not efficacious. Chemical treatments were tested and the author states that lead arsenate alone proved of any real use. Only two methods of control have proved suitable :—Spring treatment with lead arsenate, preferably applied as a wetting spray; and the employment of shelter traps in autumn. Strips of cloth or old rags, wound round the larger branches of the stocks some time before the vintage, are most suitable for this purpose.

CHATANAY (J.). **Les essais de piégeage en Champagne en 1911-1912. Les espèces dominant dans les prises.** [Light trap trials in Champagne in 1911-1912. The species predominating in the catches.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 364-371. [Received 18th Feb. 1914.]

After giving a full account of all the species of insects caught by his light traps, the author concludes by pointing out that methodical analysis of the catches alone can determine the value of light traps,

and as the cost of these is rather high it is important they should only be used when actually necessary. At Mesnil, for instance, the author discountenanced the use of all the traps available and only a few were lit. The abundance of their catches seemed to point to the advisability of using them, but analysis showed *Clysia* to be present in but a small proportion, from 1 to 3 per cent., and *Polychrosis* only from 12 to 18 per cent. Regular analysis will probably permit of reducing the working period of these traps by at least one-quarter, if not by one-third.

Vayssière (P.). **Note sur les Coccides de l'Afrique occidentale.** [Note on West African Coccids.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 424-432, 5 figs. [Received 18th Feb. 1914.]

This paper includes the description of a new Coccid, named *Lophococcus vuilleti*, sp. n., found by J. Vuillet at Kulikoro on *Acacia pennata*, Willdenow. A list of 73 species of Coccids found in French West Africa and the neighbouring regions (Gold Coast, Togoland, Nigeria and the Cameroons) is given, the habitat and food-plant being specified. A bibliography of 29 works is also included.

**La Destruction du Puceron.** [To destroy Aphids.]—*Rev. Agric. Vitic. Afrique Nord, Algiers*, xii, no. 105, 14th Mar. 1914, p. 244.

For destroying aphids in orchards and orange plantations, a mixture of nicotin, methylated spirit, sulphoricinate of soda and carbonate of potash has given good results, in so far that it kills the individuals it reaches. Methylated spirit alone is considered efficacious, but not all plants are able to withstand its action, and in all cases it should be applied in small quantities with a brush, care being taken not to injure the foliage or stems.

Marchal (P.). **La Cochylis et l'Eudémis en 1912.** [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff. in 1912.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 248-252. [Received 18th Feb. 1914.]

*Clysia ambiguella* did not cause important damage in France in 1912. *Polychrosis botrana* was generally less plentiful than before, though still present in considerable numbers in infected districts and even spreading in the South, while at Montpellier it had spread from the vine-arbours to the vineyards. The early vintage in 1911 accounts for the all round decrease of *P. botrana* in the Bordelais, except in the Sauterne and Barsac regions, where the peculiar method of gathering is to blame. Those vineyards which were subjected to insecticide treatment, particularly by nicotin, were certainly less affected. In Champagne, M. Chatenay observed that *Malachius* had helped the control due to the dry weather of the preceding year and nearly all the pupae still, present in the winter were destroyed. In experiments on *P. botrana*, M. Feytaud has been able to confirm his previous tests regarding the remarkable aborting action of nicotin on the eggs, which makes it superior to other insecticides in vineyard practice. Lead arsenate and nicotin as preventives, and pyrethrum and nicotin as curatives, are the only substances of much practical value. A solution of 1·5 to 2

per cent. of pyridin is efficacious against the caterpillars. Commercial oleate of pyridin employed at these strengths is ineffective, owing to its small pyridin content. A wetting spray containing 1 per cent. of quinoline is effective against *P. botrana* larvae ; ½ per cent. is not. Dusting is a less effective method than spraying. Nicotined sulphur and quicklime are the best for dusting. Sulphoricinate of ammonia has good wetting, sticking and insecticidal properties, but at strengths over ½ per cent. it injures the plants. It may be combined in order to reduce its causticity. At the low strength of 0·2 per 1,000 as a spray, it retains its wetting property. Thymol at a strength of 1 per cent. and associated with resin soap is effective. The author mentions the use of bait traps [see this *Review*, Ser. A, ii, pp. 405 and below] and states that shelter traps have given good results in Burgundy. Strips of cloth about 16 to 20 inches long were wrapped round the vine trunk, if possible at a bend or fork of the branches, and on examining these in December they averaged 3 pupae each. The collected trap material should be stored till spring in order to allow the parasitic Hymenoptera to hatch out; they emerge from the cocoons before the moths. The author mentions parasitic fungi [see this *Review*, Series A, ii, p. 405], but states that control by means of them was not satisfactory. The earthing up of the stocks in autumn was tried on a small scale in Saône-et-Loire and merits attention. It favours the destruction of the pupae by fungi, and when combined with the system of shelter traps recommended by Jablonowski in Hungary, effects very considerable destruction. Winter treatment is the only one of great efficacy in the South.

Vezin & Gaumont (L.). **La Cochylis et l'Eudémis dans la vallée de la Loire.** [*Clysia* and *Polychrosis* in the Loire valley.]—*Ann. du Service des Epiphyties* (1912), *Paris*, 1913, pp. 331-338. [Received 18th Feb. 1914.]

Bait and light traps were tried against the first generation of moths. Eighteen bait-traps were employed, but no *Clysia* were captured. Six light traps captured 141 moths. The Andres-Maire trap, as used in Egypt against the cotton moth, was placed in position at La Justinier on the 13th of May and by the 20th, over 200 vine Sphingids and other insects were taken, but no *Clysia*. This was ascribed to the trap being about 4½ feet above the ground, while *Clysia* flies at a height of about 2½ feet. Experiments were to be continued in 1913 with the trap in a lower position. In dealing with the second generation of moths the 6 light traps already mentioned were made use of. They captured 116 *Clysia*, 691 *Sparganothis*,343 parasitic Hymenoptera and 673 Diptera, besides other Lepidoptera. Such traps may be an efficacious means of trapping *Sparganothis* and *Clysia*, but the most beneficial insects are also taken. Of the various insecticides used, an emulsion meriting attention contained 3 lb. benzine, 3 lb. ammonia, and 10 gals. of a decoction of Panama wood (*Quillaia saponaria*), made by boiling 1 lb. of the wood in 10 gals. of water. In the laboratory tests, batches of 10 caterpillars each were sprayed with this and a mortality ranging from 5 to 8 resulted. An emulsion containing 1 lb. of rectified benzine in 2 gals. of the above decoction seems to be the most efficacious, 6 to 9 caterpillars being killed. The benzine should

be mixed with a little black soap and the mixture emulsified with the decoction. The old leaves and woody shoots do not appear to suffer; an investigation of the effect on young grapes and young leaves will be made. The Barsacq liquid contains 2 lb. of Panama wood and 1 gal. of methylated spirit in 7 gals. of water. For use it is diluted with 9 volumes of water and the authors find it causes a mortality of about 50 per cent. They also tried to effect the destruction of the pupae, but the results were most disappointing.

The collection of *Clysia* larvae is efficacious, but in the case of *Polychrosis* this method is much less useful, because of the more numerous generations and the constant presence of all forms of the insect during the fine season.

Savastano (L.). **La manipolazione della poltiglia solfo-calcica. (Formola della Stazione di Agrumicoltura.)** [The preparation of lime-sulphur mixture. (Formula of the Station for Citrus culture).]—*Boll. R. Staz. Speriment. Agrum. Fruttic., Acireale*, no. 2, Jan. 1912, 6 pp. [Received 24th Feb. 1913.]

Although published over two years ago, this paper is abstracted here in order to place on record formula recommended in it which may be regarded as a standard, and is said to be thoroughly reliable, being the result of prolonged experiment. It consists of 1 part by weight of lime and 3 parts by weight of sulphur to every 10 parts by weight of water. Ordinary sulphur is employed, as used against *Oidium*. The lime must be freshly burned, not more than 2 or 3 days old at the outside (when it begins to crumble it is useless), and must be in moderately small pieces, very small pieces or big lumps being equally unsuitable. It should be broken up and examined before weighing, any insufficiently burned pieces being rejected, and should preferably be burned with wood fuel. Iron boilers must be used, copper being attacked by the mixture. The mixture may be prepared on a small scale (35 pints) for domestic use or on a large scale (22 gals.), the respective boilers measuring approximately 15 by 16 inches and 22 by 34 inches. A galvanized iron pail is required for measuring the water, the levels for $8\frac{3}{4}$ pints and $17\frac{1}{2}$ pints being marked inside. A stick about 5 feet long is required for gauging the level of the mixture in the small boiler during boiling (a notch being made at the level of 35 pints), a 7 foot stick being used for the large boiler (notched at the level of 22 gals.). For stirring the mixture a stout stick is required, and a wire sieve should be used for rapidly dissolving the sulphur. The quantity of 35 pints for the small boiler should not be departed from, but that of 22 gals. for the large boiler may be reduced to 11 gals. The agriculturist should not attempt other changes or disappointment may result. The actual preparation is as follows:—The boiler is placed on a moderate fire with water—$8\frac{3}{4}$ pints for the small boiler and 35 pints for the large one. When the water is just tepid the pieces of lime are thrown in. No stirring should be done. When the lime begins to boil the sulphur is added, by being passed through the sieve held over the boiler. Until the operator is expert he should get a second person to sift the sulphur, while he stirs the mixture himself. Carelessness may lead to the lime absorbing all the

water and it is then dangerous to add sulphur as the latter may ignite. Where absorption occurs, some water should be measured off and added before the sulphur is put in. When the sulphur has been added, stirring must be continued until a yellow-white mixture results, the success of the operation depending on this. The mixture may be considered complete when but very little sulphur floats on the surface. If the mixture thickens too much while being stirred more water (measured) should be added. The balance of the water is now added (up to 35 pints, 11 gals., 22 gals., as the case may be) and over and above this the following quantities: $8\frac{3}{4}$ pints for the small boiler and, for the large one, either 22 pints for the 11 gallon or 35 pints for the 22 gallon lots. The mixture must boil for about one hour over a steady fire and must be kept stirred. During boiling it is absolutely necessary to success that the level of the liquid be kept up at the 35 pint, 11 gallon or 22 gallon mark, as the case may be, by the addition of hot water. From an orange colour, the liquid will darken, finally becoming of a chocolate or roasted-coffee colour, and should in any case be boiled for at least an hour. To ascertain if the liquid is well boiled a little is taken up in a wooden spoon and watched for a minute or so. If it is ready, fine light-coloured grains should be seen in a reddish liquid, and froth and floating sulphur should have disappeared or nearly so. It is necessary to wait until the mixture condenses to the exact measure and the hour-limit may be slightly exceeded in doing so. When cold, the mixture may be stored in ordinary petroleum tins, with a rag bung, or these may be soldered for transport. A glass carboy or glazed earthenware pot may be used if capable of being tightly closed. For use, this concentrated lime-sulphur mixture is diluted to the desired strength, working solutions containing from 4 per cent. to 8 per cent. [For summer treatment 4 to 6 per cent. and for winter treatment 8 per cent. seem most suitable strengths.] Experience of about 40 boilings showed that one man can only make two 22-gallon lots in a day with the means usually available. With larger boilers he might make two lots of 44 gals. each. The cost of 44 gals. concentrated lime-sulphur mixture is about 10*s*. including labour, that of 88 gals. produced in one day being proportionately less. The old mixture, even when diluted for use, cost about 3*s*. per 22 gals., and the Sicilian about 1*s*. 6*d*. per 22 gals., while this new mixture costs only about 3*d*. per 22 gals. if diluted to 4 per cent. or 6*d*. at 8 per cent. as compared with the ordinary copper-lime spray in general use at about 8*d*. per 22 gals. The new mixture is equally useful in summer and winter and keeps well for several months if sealed, which the others did not. The author states that it is of real agricultural value and is both an insecticide and fungicide at the same time.

Aulmann (G.). **Die Schädlinge der Kautschukpflanzen.** [Rubber pests.]—*Die Fauna der deutschen Kolonien, Reihe V.*, no. 5, 1913, 126 pp., 99 figs., Berlin (R. Friedländer & Sohn).

This memoir is a practical and well-illustrated account of over fifty insect pests of rubber. It discusses in considerable detail the characters, distribution and bionomics of each insect and the damage it does, describes useful control measures, and gives a bibliography.

Although primarily written from the standpoint of the German colonist, all rubber-growing countries are fully considered. In the case of insects attacking food-plants other than rubber, those which are of economic importance are recorded. The insects are arranged according to their orders and the book has a useful index.

*Castilloa elastica.* Young 2–3 years old trees are attacked by *Inesida leprosa*, Fab., a Longicorn, the young larva of which bores galleries between the bark and the wood which can only be discovered by the presence of the entrance hole and of the frass. Older larvae bore deeper into the wood. As a rule this pest is peculiar to *Castilloa*, and appears to be destroyed by the rapid growth which follows heavy rains. It seldom attacks trees standing in deep shade. It has often destroyed entire plantations, and in Kamerun *Castilloa* is no longer planted. This tree is also attacked there by *Metopodontus savagei*, Hope, and *Metopodontus cinctus*, Montr., but the larvae of these Lucanids only appear on plants already injured and can scarcely be regarded as causing primary injury. *Petrognatha gigas*, Fab., is also a pest in Kamerun and Hawaii. *Xyleborus affinis*, Eichh., damages *Castilloa* if the trees are deficient in latex through tapping. Another pest is *Crossotarsus brevis*, Strohm., of which, however, but little is known.

*Ficus elastica.* In Kamerun this tree is attacked by *Petrognatha gigas*, Fab., and var. *spinosa*, Kolbe. As the larvae of this beetle are very large, the gallery is of corresponding size and a single larva may sometimes kill a young tree, but the damage done up to the present is not extensive. The adults of the beetle *Sternotomis bohemani*, Chevr., sometimes defoliate entire branches in German East Africa. The Coccid *Ceroplastes ficus*, Newst., is perhaps a pest of this tree, and also *Ceroplastes quadrilineatus*, Newst., and *Pulvinaria jacksoni*, Newst

*Ficus infectoria* and *Ficus religiosa* are both attacked in the Cameroons by *Petrognatha gigas*.

*Hevea brasiliensis. Xyleborus affinis*, Eichh., does much damage to *Hevea* in Kamerun and Hawaii, but as with *Castilloa*, only trees depleted of sap are injured. Careless tapping exposes the wood and favours attack. The galleries are similar to those of *X. dryographus*, Baly. From a vertical gallery, horizontal branches of unequal length are made. *X. affinis* is associated with an Ambrosia fungus in the galleries and feeds on it. *X. ambasius*, another pest of *Hevea* in Kamerun, does the same, and also the smaller *X. camerunus*, Haged. *X. cognatus*, Haged., was found in *Hevea* seedlings from Ceylon. It bores horizontally until it reaches the pith which it then hollows out almost throughout its length; a fungus is also associated with it. Old plants are little attacked except in the young twigs. Of *Stephanoderes heveae*, Haged., and *Cryphalus congonus*, Haged., nothing is known except that they occur in the Belgian Congo and attack *Hevea*. On trees infested with these two insects, *Hypothenemus tuberculosus*, Haged., was also found and it was not possible to ascertain which of the pests had produced the various galleries. The smaller galleries made between the bark and the wood are probably due to *H. tuberculosus* and the larger ones extending to the pith may be attributed to the two *Stephanoderes*. The caterpillar of the moth *Orgyia postica*, Wlk., feeds on *Hevea* leaves in Java and Ceylon.

*Coptotermes gestroi* is described by Escherich as injuring *Hevea* in Malacca by tunnelling internally in such a manner that no sign of damage is apparent, the latex-producing layers being untouched. In time, however, the roots are destroyed to such an extent that a gust of wind may blow the tree down.

*Kicksia* (*Funtumia*) *elastica*. *Apate monachus*, F., has been observed on *Kicksia*. These trees when planted among *Castilloa elastica* badly injured by *Inesida leprosa* showed similar signs of injury, although there is no direct proof that the beetle was the cause of it. *Inesida obscura*, Fab., is also thought to be a pest, and *Monohammus ruspator*, Fab., is stated by von Faber to bore galleries in the older branches and the trunk. In Kamerun, Vosseler observed *Phrystola hecphora*, Thoms., injuring *Kicksia*. The larvae of this beetle bore between the bark and the wood, while those of *Phrystola assimilis*, Kolbe, mine the young branches and the adult beetles gnaw the bark. *Kicksia* is also attacked by *Phrystola coeca*, Chevr., and is injured both by the larvae and, to a greater degree, by the beetles, which ring the bark in the rainy season. As the attacks of the larvae are made in the dry season oviposition probably occurs at the end of the rains. *Kicksia* in Kamerun has suffered badly from this pest. The larvae of the Elaterid, *Tetralobus flabellicornis*, L., were found at the roots of *Kicksia*. The caterpillars of the Pyralid, *Glyphodes ocellata*, Hmps., feed on its leaves and may kill a young plant if present in numbers. Preuss states that plants 18 months old may be considered to be out of danger. A peculiar disease of *Kicksia* has been observed in Kamerun which the author says may be called "Spitzendürre" (dryness of the tips), and as no fungoid pests were noticed, it is thought that the injury was due to PSYLLIDAE sucking the leaves.

*Manihot glaziovii*. This species is attacked by *Mallodon downesi*, Hope, in German East Africa. This Longicorn lays its eggs in injured places and the larvae proceed to bore into the affected wood, thus speedily causing the fall of the tree. Other pests found in German East Africa are *Laemophloeus pusillus*, Schönh., and *Xyleborus affinis*, already discussed in connection with *Castilloa* and *Hevea*. In the Belgian Congo, Ceará rubber is attacked by *Xyleborus confusus*, Eichh. The leaves are often seriously injured by the weevil, *Dicasticus gerstaeckeri*, Fst., in German East Africa. *Lagria villosa*, Fab., both adults and larvae, also destroy the leaves, especially those of young trees. The Chrysomelid *Erythrobata punctipennis*, Wse., also eats the leaves. *Cryptocephalus callias*, Suffr., *Rhembastus varipes*, Wse., *Oides collaris*, Baly, and *Ceralces ferrugineus*, Gerst., only appear to be minor pests of *Manihot*, on the leaves of which they have been observed to feed. In German East Africa damage was also done by what was thought to be a Dipterous larva, as according to Morstatt a flow of rubber from the bark indicates the presence of footless maggots—green-white in colour, and usually in some numbers together—as many as ten being found in one spot. Old trees are chiefly attacked and infestation is irregular in one and the same plantation. Among crickets, *Brachytrypes membranaceus*, Drury, is a pest of very minor importance. Ceará seedlings are injured just above the roots by *Gryllus conspersus*, Schaum, and *Scapsipedus marginatus*, Afz. *Aspidiotus destructor*, Sign., and *Perissopneumon* (*Stigmacoccus*)

*zimmermanni*, Newst., have also been observed on this tree. *Manihot* has been attacked by Thrips, but to no considerable extent and the affected trees quickly recover after the disappearance of the pest.

BODKIN (G. E.). **The Scale-Insects of British Guiana.**—*Jl. Bd. Agric. Brit. Guiana, Georgetown*, vii, no. 3, Jan. 1914, pp. 106-124. [Received 17th March 1914.]

The author points out that references to the COCCIDAE of British Guiana are scanty, and the collection here recorded has been formed by him since 1911 and is fairly representative. A further and more complete list will be published later. The majority of the determinations were made through the Imperial Bureau of Entomology by Professor Newstead. The classification adhered to is that adopted by Mrs. Fernald in her catalogue. Scale-insects, popularly known in Demerara as " blight," are one of the worst agricultural pests in British Guiana, where some half-dozen species, widely distributed and capable of existing on a variety of cultivated plants, are annually responsible for an enormous amount of damage. The Hymenopterous parasites of the Coccids will be dealt with later. Other natural enemies include certain Lepidopterous larvae, Coccinellid beetles in their larval and adult stages, fungi, and the larvae of lacewing flies (Neuroptera). *Blastobasis lecaniella*, Busck, and two new Pyralids, *Vitula bodkini*, Dyar, and *Vitula toboga*, Dyar, are the three species of coccophagous Lepidopterous larvae found in British Guiana. Of the COCCINELLIDAE, two species which destroy *Aspidiotus destructor*, Sign., have recently been described, viz.:—*Cryptognatha nodiceps*, Mshl., and *Azya trinitatis*, Mshl. *Azya pontbrianti*, Muls., is predaceous on *S. hemisphaerica*, Targ. A number of other species await determination. Two species of entomophagous fungi are frequently found attacking colonies of scale-insects, viz., the red-headed fungus (*Sphaerostilbe coccophila*, Tul.) and the shield scale fungus (*Cephalosporium lecanii*). Parasitic fungi are especially valuable in the citrus cultivations situated inland. Local experience has shown that scale infestation may be controlled by two really efficient, simple, cheap and easily prepared washes within the reach of any cultivator, viz :—kerosene emulsion and resin compound. For use against the softer-bodied scale-insects (*Aspidiotus destructor*, mealy bug, croton bug, etc.) the following is a good formula : Kerosene oil 2 gals., water 1 gal., soap $\frac{1}{2}$ lb. The soap is first dissolved in hot water, and the kerosene added while the solution is still hot, the mixture being well stirred so as to form a good emulsion. For use, 6 gals. of water are added and the whole is thoroughly mixed. Resin compound is an excellent spray for the hard-bodied scales, though it may be used with good results against any kind of Coccid. It is prepared as follows : Resin (powdered) 3 lb., ordinary washing soda 2 lb. These substances are thoroughly mixed and dissolved by heat in a large vessel in about a gallon of water, and water up to 4 gals. is gradually added. Boiling is continued till the solution turns a clear brown colour. One part of this mixture is diluted with 4 parts of water for use. In the case of either of these sprays several applications are necessary, at weekly intervals, till the foliage, branches, etc., appear clean. The article

concludes with the following list of cultivated plants, with the scale-insects that attack them :—

Citrus Plants :—*Chionaspis citri*, Comst. (the Orange Snow Scale) ; *Selenaspidus articulatus*, Morgan (the West Indian Red Scale) ; *Chrysomphalus aonidum*, L. (the Red-spotted Scale) ; *Chrysomphalus aurantii*, Mask., *Lepidosaphes beckii*, Newm. (the Orange Mussel Scale) ; *Parlatoria ziziphus*, Lucas, *Orthezia insignis*, Douglas, *Pseudococcus citri*, Risso (the Common Mealy Bug), *Ceroplastes floridensis*, Comst. (the Florida Wax Scale), *Coccus hesperidum*, L. (the Common Shield Scale), *Saissetia hemisphaerica*, Targ. (the Brown Shield Scale), *Saissetia oleae*, Bern.

Para Rubber (*Hevea brasiliensis*) :—*Chrysomphalus personatus*, Comst., *Asterolecanium pustulans*, Ckll., *Saissetia nigra*, Nietn.

Coconut Palms :—*Aspidiotus destructor*, Signoret, *Pseudococcus nipae*, Mask., *Vinsonia stellifera*, West. (the Glassy Star Scale).

Sugar-Cane :—*Aspidiotus sacchari*, Ckll., *Ripersia* sp., *Pulvinaria* sp., *Pseudococcus citri*, Risso.

Banana and Plantains :—*Diaspis boisduvalii*, Signoret, *Aspidiotus destructor*, Signoret.

Cacao :—*Pseudococcus citri*, Risso.

Coffee :—*Selenaspidus articulatus*, Morgan (the West Indian Red Scale), *Ischnaspis longirostris*, Sign., *Coccus hesperidum*, L., *Saissetia hemisphaerica*, Targ. (the Brown Shield Scale).

Mango :—*Aulacaspis rosae*, Bouché (the Rose Scale), *Coccus mangiferae*, Green (the Mango Shield Scale).

Egg Plant (*Solanum melongena*) :—*Aspidiotus cydoniae*, Comstock, *Pseudococcus virgatus*, Ckll.

Ferns :—*Pseudococcus citri*, Risso, *Ceroplastes floridensis*, Comst. (the Florida Wax Scale).

Ochroe :—*Saissetia nigra*, Nietn.

Avocado :—*Pulvinaria pyriformis*, Ckll. (the Mealy Shield Scale), *Aspidiotus destructor*, Sign., *Chrysomphalus personatus*, Comst.

Native Rubber-producing Tree (*Sapium janmani*) :—*Howardia biclavis detecta*, Maskell, *Saissetia nigra*, Nietn.

Orchids :—*Diaspis boisduvalii*, Signoret, *Chrysomphalus biformis*, Ckll., *Asterolecanium pustulans*, Ckll.

Cotton :—*Hemichionaspis minor*, Ckll., *Saissetia nigra*, Nietn.

Barbados Cherry (*Malphigia glabra*) :—*Lepidosaphes beckii*, Newm., *Orthezia insignis*, Douglas.

Castor Oil Plant :—*Chionaspis citri*, Comstock.

Bamboo :—*Asterolecanium bambusae*, Bdv. (the Bamboo Scale).

Akee :—*Asterolecanium pustulans*, Ckll.

Crotons :—*Saissetia nigra*, Nietn., *Orthezia praelonga*, Douglas (the Croton Bug), *Lepidosaphes beckii*, Newm., *Pseudococcus citri*, Risso, *Saissetia hemispherica*, Targ., *Saissetia oleae*, Bern.

Millen (F. E.). **Foul Brood.**—*Michigan Agric. Expt. Sta., East Lansing, Special Bull*, 64, Jan. 1914, 8 pp.

Besides the two foul-brood diseases, American foul-brood and European foul-brood, there is a third brood disease known as sacbrood, believed to be caused by a filterable virus, which older beekeepers will recognise as " pickled " or " sour-brood." Sacbrood differs from

American foul-brood inasmuch as ropiness and the gluey smell are lacking, and the dead larvae usually can be taken from the cells without breaking their skins. It differs from European foul-brood in the lack of odour, and it never has the greasy melted appearance so typical of certain stages of European foul-brood. The symptoms vary in the same hive, some of the dead larvae are extended and flattened in the cell, with black spots on the head. These usually lose their segmented appearance. Other larvae, while extended, have a rounded shape, with the segmentation of the body well marked. The brood dies after the time of capping and the dead larvae are therefore almost always found extended lengthwise in the cells and lying with the dorsal side against the lower wall. When larvae, dead of this disease, are found in uncapped cells, the cap has been removed by the bees after death, though occasionally a capping has a hole through it, indicating that it had never been completed. A larva dead of this disease assumes at first a slightly yellowish tint, but in process of decay, brown is the most characteristic colour. It is not usually necessary to treat a colony for sacbrood unless it is weakened, when the same treatment as for American foul-brood is applicable. Sacbrood seldom becomes epidemic, but will spread if frames of brood and honey are changed from an infected colony to a healthy one. The paper gives the full text of a new law dealing with the Inspection of Apiaries passed during the Legislative Assembly of 1913, and described as an Act for the suppression of contagious diseases among bees in the State of Michigan.

**Insetti nocivi, crittogame ed altri mali riscontrati in Provincia di Girgenti negli anni 1910-1913.** [Injurious insects, cryptogams and other pests found in the Province of Girgenti from 1910 to 1913.]—*L'Agricoltore Agrigentino, Girgenti*, vi, no. 2, Feb. 1914, pp. 25-28.

Vine pests. *Phylloxera vastatrix* first occurred some 30 years ago in the province of Girgenti, but along the coast the sandy soil has enabled European stocks to resist it. Carbon bisulphide and submersion and cultivation in sandy soils are the only effectual remedies.

*Rhynchites betuleti*, a metallic green weevil known as the "Sigaria della vite," appears in May and the female makes cigar-shaped rolls of the leaves and deposits her eggs therein, the larva feeding on the leaves and pupating in the ground. The injury is not considerable, but the collection and destruction of the leaf-rolls is advised.

Melolonthid larvae of an undetermined species seriously injure the vine roots, especially in light soils. Carbon bisulphide may be efficacious against these if injected in autumn, from two-thirds of an ounce to one ounce per square yard being required. The Orthopteron *Brachytrypes megacephalus*, locally called "Cicalone," is exceedingly voracious and capable of destroying entire vineyards. Poison baits consisting of vine leaves dipped in a solution of water, bran, flour and arsenic are advised.

Damon (S. C.). **The Potato.**—*Rhode Island State Agric. Coll. Kingston, Extension Bull.*, iii, no. 12, Feb. 1914, 4 pp.

The author says that control of the flea- and Colorado-beetles, which

hatch out about the first of July, is easily effected by applying a spray of lead arsenate—3 lb. in 50 gals. of water.

Vassiliev (Eug. M.). **Новѣйшія данныя о гусеницахъ, повреждающихъ важнѣйшіе плоды въ Россіи и Зап. Европѣ.** [The latest data concerning caterpillars which injure the principal fruit-crops in Russia and Western Europe.]—Reprint from **«Садоводъ и Огородникъ.»** [*Horticulturist and Market Gardener.*] *Kiev*, nos. 46-47, 1913, 12 pp.

The family Tortricidae supplies four species injurious to fruit, all belonging to the subfamily *Epibleminae*. *Cydia* (*Carpocapsa*) *pomonella*, found everywhere in Europe (except in the extreme North), North Africa, Asia Minor, Turkestan and North America, injures apples, pears, and also, according to Schreiner, plums, apricots, white cherries, quinces and walnuts. *Cydia* (*Carpocapsa*) *amplana*, Hb., found in France, Germany, Moravia, Hungary, North and Central Italy, attacks oak, walnut, beech, edible chestnuts and hazelnuts. *Cydia* (*Grapholita*) *funebrana*, Tr., is found in France, Italy, Central Europe, Scandinavia, North-Western and South-Western Russia and Asia Minor. According to Spuler, the first generation breeds in the stems of shoots, while the second lives inside stone fruits. *Pammene rhediella*, Clerk, found in Norway, Central Europe, Italy, Dalmatia, Asia Minor, Finland and in one government of Central Russia, breeds in unripe fruits of apple, plum, medlars and of *Cornus sanguinea* (dogwood)

*Argyresthia conjugella*, Zell., (Hyponomeutidae) occurs in Russia, Finland, Sweden, Norway, England, Central Europe, Italy, Asia Minor, Japan and North America ; in Russia it has been found by Rodzianko as far south as the government of Kursk. In North and Central Russia this pest is more serious than *Cydia pomonella*. *Argyresthia cornella*, F., breeds in the buds of apple trees and of *Cornus* in the South of France, Central Europe, Livland and South-Eastern Russia.

*Anarsia lineatella*, Zell., (Gelechiidae) occurs in the South of France, Sardinia, Germany, Austria-Hungary, Dalmatia, Asia Minor, Syria, and North America. In Russia it is known only in the Crimea and in Smiela (government of Kiev), where it injures apricots and peaches. *Sarrothripus musculana* Ersch., (Noctuidae) injures walnuts in Turkestan.

The author also figures and describes the caterpillars of *Cydia pomonella* and *C. funebrana*. The larvae of *C. funebrana* have a line of short thick bristles beneath the anus, which is absent in those of *C. pomonella*. The penultimate segment of the *pomonella* larva has a small, dark, central plate, bearing two long bristles ; in *C. funebrana* there is no plate, only a line of small, dark-coloured spots. The larvae of *funebrana* are also smaller and of a deeper rose colour than those of *pomonella*.

MARCHAL (P.). **Rapport phytopathologique pour l'année 1913.** [Report on injurious insects in France during the year 1913.]—*Rev. Phytopath. App., Paris*, nos. 18-19, 23th Feb.—5th March 1914, pp. 9-13.

Oats have suffered from *Cecidomyia avenae* in Morbihan. In the department of Gers, maize was seriously attacked by *Pyrausta nubilalis* and, in a lesser degree, by *Aphis euonymi*. Lucerne was badly injured by *Colaspidema atrum* at Deux-Sèvres in Tarn-et-Garonne; this pest was also reported from the Bouches-du-Rhône, Drôme, Basses-Alpes, Aude and Lot-et-Garonne. In Tarn-et-Garonne, the seed crops of clover were devoured by the larvae of *Apion apricans*. In May, *Otiorrhynchus ligustici* caused much damage to sown seed in Beuce. Feytaud noticed *Hylastinus obscurus* larvae injuring clover in the Gironde. *Aphis euonymi* has proved injurious to beetroot in many districts, especially in the North and in Hérault, as also were *Haltica* and the larvae of *Cleonus mendicus* in Hérault and *Lixus scabricollis* at Montpellier. *Phthorimaea operculella*, the potato tuber moth, is still limited to some communes south of the Maures. The hop aphis, *Phorodon humuli*, has again seriously damaged the hopfields in the North in spite of repeated spraying with tobacco extract; this treatment has, however, proved more efficacious in the Dijonnais and Côte-d'Or. In the same region the red spider, *Tetranychus telarius*, does much harm, and unfortunately many growers consider it to be beneficial as its appearance generally coincides with the disappearance of the aphids. An outbreak of *Pieris* caterpillars was reported from Meurthe-et-Moselle. In Finistère, cabbages and other Cruciferae have suffered much from *Haltica* and in the Loire Valley the asparagus beetle, *Crioceris asparagi*, has done much harm, though arsenic or nicotin sprays have proved successful in many localities. Mole-crickets have been troublesome in the important market-gardens of the Pyrénées-Orientales. In the same department, in Tarn-et-Garonne and in the Var, artichokes have suffered from *Gortyna ochracea*. In Ardèche, *Depressaria marcella* still does some injury to fennel and seed carrots. Damage has been done in the Var by the carrot fly and in Dordogne by the celery fly, *Acidia heraclei*. *Hylemyia antiqua*, Meig., the onion-fly, has caused severe loss in the gardens between Dijon and Saint-Jean-de-Losne. In Gers, peas have suffered from the attacks of a butterfly *Lampides boetica*, the caterpillar of which develops inside the pods. *Cydia* (*Grapholita*) *pisana* also attacked this crop, but less extensively than in the previous year. *Thrips tabaci*, Lind., has proved very injurious to leeks near Mans and in the Croissy-sur-Seine region. Another Thrips, *Physapus pisivora*, Westw. (*P. robusta*, Uzel) injured peas at the Chesnoy Agricultural School, this being the first time it appears to have been reported in France as causing injury. In the case of orchards, *Schizoneura lanigera* has increased this year in many districts, particularly near Paris, in the Orléannais, Anjou, Côte-d'Or and several southern departments, such as the Pyrénées-Orientales and Var. Damage done by *Hyponomeuta* has been reported from the Sarthe, Eure, Seine-Inférieure and Puy-de-Dôme. *Anthonomus pomorum* has been injurious in the departments of Sarthe, Loire, Côtes-du-Nord, Puy-de-Dôme. In this last department, the caterpillars of *Cheimatobia* have been successfully combated by "sticky

bands," which have captured many moths. This same insect has damaged plum, cherry and black currants in the Côte-d'Or, and has also appeared in the south-west, while *Hyponomeuta*, so often injurious there, has not caused anything in the way of serious injury. This also applies to *Hoplocampa fulvicornis*, the saw-fly of the plum, but this fruit has been severely attacked by *Cydia funebrana*. In the orchards damaged by the April frosts, about three-quarters of the crop were injured by this pest. The fig scale, *Ceroplastes rusci*, has multiplied considerably in the South. In Var, cherry trees have been much attacked by *Eriocampoides limacina*, while the cherry fly has been very common. Near Dijon, *Aegeria tipuliformis* continues to injure black currants. Extensive strawberry beds in Lot were severely attacked by *Rhynchites minutus* and they were injured in Clarente-Inférieure by a new pest, the sawfly, *Cladius padi*. Nearly everywhere the damage done by *Clysia ambiguella* and *Polychrosis botrana*, especially by the second and third generations, has been more severe than in 1912. In the south-west, *P. botrana* has proved the more formidable enemy, and much injury was done from the first generation onwards. In Graves de Bordeaux and in Médoc, the attacks were particularly severe, while in Sauternais they had diminished Bait traps are now coming into general use in the Bordelais, in the Loire valley and in certain parts of the South. In many instances the results are very encouraging. In Champagne, where the second generation of *C. ambiguella* has been very injurious, light traps have not been a success. *Sparganothis pilleriana*, usually regarded as of no importance in the south-west, has increased during the past two years in the Loire valley. Light traps captured quantities in July and August. *Arctia caja* appeared in large numbers in the South, particularly in Hérault, and though *Apanteles* were absent, *Entomophthora* (*Empusa*) *aulicae* and *Bacillus cajae* checked it. *Haltica* caused serious injury in the Côte-d'Or, but arsenate of lead was used to great advantage and the treated vines remained intact in the centre of the infected districts. Treatment was generally neglected in the Beaujolais and *Haltica* has increased in many localities, but owing to their faith in the power of arsenicals, the growers are not much alarmed. In the south-west, this pest is regaining the ground lost through the dry summer of 1911. *Malacosoma lusitanica* has been found on vine shoots in the Gironde. Arsenicals were used with success against *Rhynchites betulae* which appeared very abundantly in Hérault in the month of April. This insect was also very numerous in Vienne and Charente. *Otiorrhynchus sulcatus* has done serious injury to vines on the island of Oléron. Vine scales have been particularly plentiful in the south-west and an extended area of infestation by *Eulecanium persicae* was found in Bas-Médoc. *Tetranychus* has also increased in the Pyrénées-Orientales. A similar invasion occurred in 1906 after a dry summer like that of 1913.

The olive fly, *Dacus oleae*, has increased, particularly in the Pyrénées-Orientales, Var, Hérault, Alpes-Maritimes and Corsica. In conjunction with the olive moth (*Prays oleae*) it has done much harm in Var and the Drôme. *Simaethis nemorana* has been quite as plentiful on fig trees as in 1912, both the fruit and the leaves being attacked. *Novius cardinalis* has effectually checked *Icerya purchasi*, which was threatening southern plantations, more particularly the citrus

plantations on the Mediterranean coast. *Euproctis chrysorrhoea* and *Lymantria dispar* have continued to be of rare occurrence in the forests. The latter pest did, however, invade several hundred acres in Lot-et-Garonne, attacking cork oaks and pines. It also occurred in the Landes and in the south it attacked evergreen-oak and *Quercus coccifera*. *Calosoma sycophanta*, a fungoid disease and *Coccobacillus lymantriae* fortunately killed the caterpillars. In Hérault the processionary caterpillar of the oak damaged white oak, that of the pine being much rarer. *Pityogenes bidentatus* severely injured some plantations of Austrian black pine in Marne. Cockchafers were expected in abundance in 1913, but few complaints seem to have been made. They appeared in somewhat large numbers in Loiret, Doubs, Ain, Seine-et-Marne, Saône-et-Loire, Indre and Vienne.

DROUSSIE (P.). **Note sur la culture du cocotier. Ennemis du cocotier.** [Note on cultivation of the Coconut-Palm. Enemies of the Cocoanut-Palm.]—*Bull. Agric. du Congo Belge, Brussels*, v, pt. 1, March 1914, pp. 44-48.

In this article, which deals with the general cultivation of the coconut-palm in the Belgian Congo, the author says that the enemies of the palm are numerous, including men, monkeys, rodents, certain birds and insects. The insects are formidable because the damage they do is not generally discovered until it is very serious. This is especially the case with certain Coleoptera, amongst which *Oryctes* is the most to be feared. It has done so much damage in Malaya, that the government of the Malay States has been obliged to compel the planters to take steps to suppress the pest. At Topo, in Nigeria, *Aspidiotus destructor* has attacked the plantations and it has also been reported in the Portuguese colonies on the East Coast of Africa, but it was controlled by the careful collection and burning of all leaves found to be attacked.

GUDKOV (—). **Грушевая медяница и борьба съ нею вновь скомбинированной керосино-известковой эмульсiей.** [*Psylla piri* and the fight against it by means of a new combined kerosene-lime emulsion.]— **«Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*,] *Tashkent*, no. 3, March 1914, pp. 263-289.

The author describes an outbreak of *Psyllà pyri* in 1913 in the district of Tashkent, and the fungus which grew on the damaged trees; he thinks it likely that the outbreak may recur this year. The imago can be seen flying about on warm days during the winter, and in spring as soon as leaves appear, eggs are laid on the inner surface, the larvae hatching in about a week. Both the larvae and the nymphs of the first generation give out a small amount of liquid, the so-called "honey dew." In June, the number of insects on the wing and the number of eggs laid decreases, owing to the death of the hibernated insects and the yet undeveloped sexual state of those of the first generation. In July and subsequently, new generations appear up till late in autumn. The larvae of the second generation, which appear at the end of July, live on leaves and shoots, but covered with drops of honey dew, the weight of which brings the leaves into a vertical position, the

drops therefore falling to the ground. The development of the second generation proceeds rapidly at the beginning and middle of August, and if remedies are not applied in time the trees may be defoliated by the end of August. The "dew" on the trees and fruits favours the development of a fungus which lowers the commercial value of the fruit.

The best time for attacking the pest is the moment when the larvae appear, and spraying must then be immediately applied and repeated when necessary. The best insecticide is the kerosene-lime emulsion which the author had already tried in 1910 in the Crimea. He gives the following recipe for this :—1 lb. of lime is slaked in $1\frac{1}{2}$ pints of water, to which 1 lb. of kerosene is afterwards added, the liquid being stirred all the time. This emulsion destroys not only the larvae and nymphs, but also the adults, and is effective against aphids When the leaves are older the amount of kerosene may be doubled.

The author thinks that the fine particles of kerosene become covered with hydrated lime and that this prevents the injurious action of the kerosene on the trees, and secured the good results obtained by applying this insecticide in one locality, which in 1912 was considered the breeding focus of the pests. The cost of about $2\frac{3}{4}$ gallons of this insecticide is about 1*d*., while in the case of tobacco decoction it is 3*d*., and of quassia $4\frac{1}{2}$*d*. The author denies the statement that kerosene injures the rubber hose of the sprayers.

BOGOLJUBOV (S.). **Новый видъ наѣздника-паразита хлопковаго коробочнаго червя : его біологія и его сельско—хозяйственное значеніе.**—[A new species of *Habrobracon* sp., parasitising caterpillars of *Chloridea obsoleta*, F. : its biology and its agricultural importance.] **«Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent*, no. 3, March 1914, pp. 281-291, 5 figs.

*Chloridea obsoleta* (*Heliothis armigera*) and *Laphygma* (*Caradrina*) *exigua* were observed in the district of Tashkent during 1913 on tomato plants and invaded even the adjoining cotton plantations. The caterpillars of the former pest have been attacked there by a small parasite, which will shortly be described by Kokujev, as a new species of *Habrobracon*. The author gives a short description and a figure of the parasite, which was first found by him on 14th July 1913 in some tomato fields. While searching for caterpillars of *C. obsoleta* he frequently found motionless, soft, but not decomposed caterpillars which had not changed colour ; they were usually hanging upside down, holding on with their legs to the edges of the holes made on the underside of the fruit. Evidently the object of the caterpillars is to protect themselves against attacks from various enemies and in all cases where the entrance to their burrows was well hidden, they were found healthy, while in cases where this had not been done, the caterpillars had been attacked This led the author to think that the disease was not due to a fungus, against which concealment would be no protection, but to a parasite, and after a prolonged search, he found one parasite inside a fruit, in which a hole had been gnawed previously by a caterpillar. The author placed this individual and a larva of *C. obsoleta* in a glass and was able to observe the mode of attack. The parasite showed

great patience and caution in approaching its victim, and after a considerable interval, pierced the body of the caterpillar with its ovipositor, repeating the attack until the caterpillar became paralysed. After this the parasite drinks the juices from the wounds, and then proceeds to oviposit. Ten eggs of relatively large size, the egg being ½ mm. long, while the parasite is only 5 mm. long, were laid on the host. The larvae of the parasite hatched on the third day and penetrated into the interior of the body of the caterpillar. These larvae are of a yellow colour, but change while feeding to the colour of the host. They grow very quickly, and on the second morning eight out of the ten larvae were preparing cocoons.

Pupation took place either on or near the caterpillar's body, and the pupal stage lasted 5 days, 8 days being thus required for the development of the parasites. Only females were reared from the ten pupae. Three of these oviposited parthenogenetically on caterpillars offered for this purpose, and produced males ; the antennae of which are longer than those of the females. The rearing of further generations continued till late in autumn, and as the weather became colder, the time required for development was longer. At the end of the summer it was about 2 weeks, in September 18–20 days. The number of caterpillars attacked by the parasites was very great, and in many cases was larger than the number of healthy caterpillars.

*Habrobracon plotnikovii* attacked caterpillars of *C. obsoleta* and *Laphygma exigua* in the open, and in the laboratory (but not in nature) also those of *Polia suasa*, Schiff. (*Mamestra dissimilis*, Knoch), *Pieris brassicae*, L., *Colias* and *Tephrina arenacearia*, Hb. The parasites also tried to attack in the laboratory caterpillars of *Cydia pomonella*, but were unsuccessful owing to their strength. With the assistance of the author the parasite was able to drive its ovipositor several times into an individual, but without effect, the caterpillar being quite healthy the next morning.

The author suggests the breeding of these insects by keeping the parasitised caterpillars of *C. obsoleta* found during the harvest of tomatoes and thus allowing them to complete their development.

Vassiliev (Eug. M.). **Важнѣйшія поврежденія и болѣзни хризантемъ.** [The principal injuries to and diseases of chrysanthemums.]—Reprint from **«Садоводъ и Огородникъ.»** [*Horticulturist and Market-Gardener*,] *Kiev*, nos. 6-7, Feb. 1914, 8 pp.

The author gives a list of pests of chrysanthemums based on an article by G. Guénaux in *La Vie Agricole et Rurale* and on the observations conducted at the Station in Smiela by himself and Gogojavlenskaja.

*Heterodera radicicola*, Greef. This worm penetrates into the tips of the smallest roots, causing galls on them. As remedies the author suggests : replanting in sterilised soil after the swellings on the roots have been removed, and not manuring with night soil unless a solution of iron sulphate in the proportion of 1 gram in a litre of water is added to it.

*Aphelencus olesistus*, Ritz. Bos, destroys the tissues of the leaves and is also a serious pest of cultivated ferns (*Pteris*, *Asplenium* etc.). The removal and burning of the attacked leaves is recommended.

*Phytomyza geniculata,* Macq. These flies oviposit on the leaves in which the larvae form mines; they pupate either in the mines or in the earth; 5–6 generations are bred during the year, the later generations being subjected to attacks from parasites. The same larvae also mine the leaves of clover, sunflower, peas, ground nuts, endive, carrots, cabbage, cucumbers, market-garden dill and reeds. Burning of the leaves attacked, spraying with 1 in 10,000 solution of nicotin in water and the watering of the compost every 14 days with a 5 per cent. tobacco extract are recommended.

*Adelphocoris lineolatus,* Goeze (fam. MIRIDAE), is found everywhere in Europe. The injuries to chrysanthemums are caused by the insects sucking the juice from the buds, and by oviposition on the young shoots or buds, which dry up soon afterwards. Other food-plants of this pest include: Beet, *Chenopodium,* Lucerne, Onions, *Euphorbia, Eryngium, Carduus, Salvia, Verbascum.* In the southern part of the government of Kiev, the author found these pests after the middle of June, and I. V. Vassiliev found them in the government of Ekaterinoslav after the beginning of June. Two generations are bred during the year, the second ovipositing in the lower parts of the shoots. Thus it follows that the proximity of lucerne, beet, or any of the above-mentioned weeds is not favourable to the cultivation of chrysanthemums. Chifflot recommends spraying with 1 per cent. tobacco extract, accompanied by a dusting of the shoots and buds with sulphur, every 14 days from May to September; this remedy aiming at destroying the wingless larvae and preventing oviposition by the females.

*Aphrophora alni,* Fall. (fam. CERCOPIDAE), oviposits on a large number of plants, also on chrysanthemums, both larva and imago sucking the juices of the plants. The same remedies as against *Adelphocoris lineolatus* are recommended, but the spraying, etc., must begin at the end of March.

*Steganoptycha minutana,* Hb. (fam. TORTRICIDAE), which attacks in the larval stage the collar and tender shoots of the young plants, may be controlled in the same way.

VAYSSIÈRE (P.). **Note sur quelques Coccides nouveaux ou peu connus.** [Note on some new or little known Coccids.]—*Bull. Soc. Entom. France, Paris,* 1914, no. 7, pp. 206-208, 1 fig.

Two new species of COCCIDAE are described, namely *Diaspis senegalensis,* taken on the leaves of *Khaya senegalensis* (African mahogany) in Upper Senegal, and *Aspidiotus* (*Hemiberlesia*) *provincialis,* on a grass (?*Psamma arenaria*) at Carry-le-Ronet, in Southern France. Short notes on other Coccids are given, the following species occurring on plants of economic importance:—*Lachnodius greeni,* Vayss., on *Coffea robusta* and *C. liberica* in Madagascar; and *Mytilaspis* (*Coccomytilus*) *dispar,* Vayss., on Manihot (cassava) also in Madagascar.

PICARD (F.) & RABAUD (E.). **Sur le Parasitisme externe des Braconides.** [External parasitism in the family BRACONIDAE.]—*Bull. Soc. Entom. France, Paris,* 1914, no. 8, pp. 266-269.

The authors record that external parasitism in the BRACONIDAE is

by no means rare. In the genus *Bracon* it seems to be the rule rather than the exception; in one case, the authors observed larvae of this genus which were predaceous on the larvae of the beetle *Lixus scabricollis*; the parasite was attached to the integument of the host, and by the time it became a nymph, nothing was left of the host but the skin. Two other species of *Bracon*, namely *variator* and *dichromus*, were observed to be external parasites on species of *Larinus* and *Myelois*.

Certain species of *Bracon* limit their choice of a host to a few nearly related species; others, however, are found parasitic on almost any host, and the same species of *Bracon* is found on Coleoptera, Diptera or Lepidoptera. It would seem, at least in certain cases, that the parasite is not attracted by specific insects so much as by the plants on which these live; *B. scutellaris* develops equally well on species of *Cydia* (*Grapholita*), *Hylesinus* and others, species which are not related to each other, but which all live on Conifers. Other similar cases have been observed, notably that of *B. colpophorus*, which attacks indifferently species of *Apion* or of *Bruchus*, whose only point in common is that they live on leguminous plants. It is also thought that the eggs of the parasite are not invariably deposited where the larvae will be certain of finding prey, but that the insects lay their eggs on particular plants, the meeting of a possible host being left to chance, the only condition being that the plant is the one frequented by the natural host of the parasite.

Of special economic interest is the fact observed that *Microbracon mellitor*, one of the principal enemies of the cotton boll-weevil (*Anthonomus grandis*) in America, is an external parasite of this host.

CLEGHORN (J.). **Melon Culture in Peshin, Baluchistan, and some account of the Melon-fly pest.**—*Agric. Jl. India, Pusa*, ix, pt. 2, April 1914, pp. 124-140, 3 pl.

Samples of adults, maggots in all stages of development, eggs and pupae of the Melon fly (*Carpomyia pardalina*) have been taken from all kinds of melons, cucumbers, and vegetable marrows. The life-history of the fly is as follows: egg stage 4 days, larva 14 days, pupa 13 days and fly about 20 days. When the fruit is about 10 days old, the hole in the rind disappears. The young grubs make their way to the seed pulp, leaving the egg-shell in the rind where the egg was deposited. During the time the grub is feeding on the seeds and the pulp surrounding them, it constructs tunnels to protect itself from the fruit juice which accumulates by gravitation at the posterior end; but if the fruit be turned over, the grub has to leave off feeding to construct new protective tunnels that will allow a clear passage for it to obtain its supply of air. If the fruit has not been disturbed, the grub after about 15 days from the laying of the egg, commences to eat its way through the edible pulp towards the rind, which takes it about two days, and it then cuts its way out, head foremost, and goes into the earth under the fruit, where pupation occurs within an inch below the surface.

A successful remedy for the extermination of the pest would be to turn over the fruit frequently and early in the season, as it lies ripening on the ground. This method is actually practised, but from different motives, the natives believing that the improvement noticed in the

fruit thus treated is due to all parts of it receiving equal amounts of sunshine, but in any case it is not carried out early enough or perfectly enough to be of much use in destroying the pest. The remedy suggested by the author is that each selected fruit should be placed in a light muslin bag, which should be drawn close round the stem. When the fruit so protected attains the age of six days, the bag could be removed and placed over some other fruit; one bag would then serve for the protection of about twenty young melons during each season. If it is desired to obtain heavy crops of, for example, 40,000 melons per acre, valued at £933 6*s*. 8*d*., 2,000 bags would be required at a cost of not more than £6 13*s*. 4*d*. Without bags or some protection against the fly it is only possible to produce about 2,500 melons per acre, locally valued at £53 6*s*. 8*d*.; if the labour for fixing and removing each bag cost one farthing per fruit, the cost per acre for this labour would be only £41 13*s*. 4*d*.

HARTLESS (A. C.). **Mango Crops and some Factors influencing them.**—*Agric. Jl. India, Pusa*, ix, pt. 2, April 1914, pp. 141-159.

On the whole, the mango in Northern India is a healthy tree; no serious fungoid disease is known, and only two kinds of insects attack it seriously. The more troublesome of these is a species of *Idiocerus*, belonging to the family JASSIDAE, commonly known as the "mango-hopper," and in Northern India by the vernacular name of "Chappe." Comparatively little is known about this insect, which is fortunately not of frequent occurrence; in one case an interval of eight years, and in another fourteen, occurred between successive attacks. The immediate effect of the attack is the dropping of the flowers, the foliage not appearing to suffer. The insect disappears after the flowering season. Spraying with crude oil emulsion is suggested, but it must be done before the insect becomes adult.

The other pest is the mango-fly, *Dacus ferrugineus*, Fabr. The female lays eggs in the tissue of the fruit, piercing the rind by means of its ovipositor. The maggots live in the pulp, tunnelling through it in all directions, and after about 10 days, leave the fruit and enter the earth to pupate, in which stage they remain about a week. The fruits attacked suddenly split and turn yellow, the maggots being usually found in the rotting pulp. On some trees, quite 10 per cent. of the fruit is attacked, while others close by, escape altogether.

A pest of lesser importance is a large Coccid, *Monophlebus* sp. It is found every year on mangoes, and recently has attacked oranges also. Spraying with kerosene emulsion helped to keep it under control, but it is more effectively checked by hot winds.

FROGGATT (W. W.). **A descriptive Catalogue of the Scale Insects (Coccidae) of Australia.**—*Agric. Gaz. N.S.W., Sydney*, xxv, pt. 4, April 1914, pp. 311-319, 1 pl.

The second part of a catalogue of Australian COCCIDAE includes accounts of 25 species belonging to the genus *Aspidiotus* [see this *Review*, Ser. A, ii, p. 324.] Four new species are described, namely *A. gidgei*, occurring on the foliage of the Gidgei (*Acacia cambagei*), at Pera Bore; *A. junctilobius*, found on the twigs and leaves of the Yarran

(*Exocarpus aphylla*), at Whitton ; *A. rubribullata*, on the stems of a species of Eucalyptus, near Perth ; and *A. serrata*, on the leaves of the Gidgei (*Acacia cambagei*) at Pera Bore.

Malaquin (A.) & Moitié (A.). **Observations et Recherches experimentales sur le Cycle évolutif du Puceron de la Betterave** (*Aphis euonymi*, **F.**) [Observations and experiments on the life-cycle of the beetroot Aphis (*Aphis euonymi*).]—*C. R. Acad. Sci., Paris*, clviii, no. 19, 11th May 1914, pp. 1371-1374.

As the results of observations and experiments on the beetroot aphis (*A. euonymi*, F.), the authors have shown that the fertilised eggs laid in the autumn on the bean (the intermediate host plant) do not hatch, whereas they hatch normally on *Euonymus europaeus* (spindle tree), the principal host plant. In the second place, if the larvae hatching from these eggs are placed on the leaves of the beetroot they do not attempt to feed on it. It is thought that the first generation of larvae are not adapted to feed on plants other than those on which they hatch, but that later generations gradually acquire this adaptability.

Mokrzecki (S. A.). **Энтомологическій календарь для садоводовъ.** [Entomological Calendar for Horticulturists.] 4th enlarged and illustrated edition, Simferopol 1913, 56 pp. 48 figs.

The author says that the information supplied by his calendar is specially calculated for the government of Taurida, but may also be useful for other localities. He indicates the work which must be undertaken each month in orchards to protect the trees from insect pests and fungoid diseases. The methods of preparation of insecticides and fungicides, and various sprayers and other appliances are described and, in many instances, figured.

In February, special attention is directed to the eradication of winter nests of *Aporia crataegi* and *Euproctis chrysorrhoea*, while in the second half of this month and in March and April, steps must be taken against various *Rhynchites*. The month of May sees the beginning of the fight against *Hyponomeuta malinellus* and *Cydia* (*Carpocapsa*) *pomonella* ; in June and July, bait belts against the latter and spraying with djipsin against *Malacosoma neustria* and *Lymantria dispar* must be applied ; in August and September remedies against *Cydia pomonella*, *Choreutis parialis*, and *Pseudococcus vitis* are urged. In October, November and December, *Cheimatobia brumata* and *Hibernia defoliaria* emerge and oviposit on the trees, sticky belts being recommended as a remedy. These insects appear in the Crimea on about 28th November, in Central Russia at the beginning of October, and in South Russia at the beginning of November. These months are also suitable for beginning the destruction of the eggs of *Lymantria dispar* and of pupae of *Clysia* (*Cochylis*) *ambiguella*.

In December and January, fruit trees ought to be cleared of branches injured by *Scolytus rugulosus* ; the larger branches, which it would be a pity to cut off, can be smeared with carbolineum and lime ; the collection of winter nests of *Euproctis chrysorrhoea* and *Aporia crataegi* can be proceeded with.

In conclusion, the author draws attention to the necessity of knowing the biology of various insects in order to conduct a successful campaign against them. He gives a list of pamphlets on pests issued by the Bureau of Entomology of the Russian Department of Agriculture and by the various Zemstvos.

LINDINGER (L.). **Afrikanische Schildläuse.** [African Scale-Insects.] —*Station für Pflanzenschutz, Hamburg*, xv, 1913, 42 pp., 9 figs.

The present paper deals with the scale-insects of German East Africa; eight new species are described; including these, the number of species recorded is 88, representing 28 genera and 7 sub-families. A key for the determination of the sub-families is given, followed by a descriptive list of the species. The following are the new species described: *Aspidiotus elegans*, *A. tectonae*, *Chionaspis usambarica*, *Icerya splendida*, *I. sulfurea*, *Lophococcus carinatus*, *L. glaber* and *L. parvus*. A list is given of plants attacked, and of the species associated with each. The following are of economic importance: *Phenacoccus obtusus* on *Adansonia digitata*, *Albizzia lebbek*, *Encephalartus* sp., *Gossypium* sp., *Landolphia* sp., and *Tectona grandis*. *Pseudococcus citri*, on *Ananas sativus*, *Gossypium* sp., *Coffea arabica* and *Solanum tuberosum*. *Icerya aegyptiaca* on *Acalypha* sp., *Ficus indica*, and *Rosa* sp. *Orthezia insignis* on *Coleus* sp., *Mina lobata*, and *Solanum seaforthianum*. *Aspidiotus destructor* on *Agave mexicana*, *Cinnamomum camphora*, *Cocos nucifera*, *Manihot glaziovii*, palms, *Pandanus utilis*, *Syzygium jambolanum*, and *Piper subpeltatum*. *Aulacaspis rosae* on *Rosa* sp. *Lecanium nigrum* on *Flacourtia sapinda*, *Gossypium* sp., *Inga* sp., and *Manihot glaziovii*. *L. viride* on *Coffea arabica*.

A descriptive list of some of the Coccids found in East Africa outside German territory is added, including 8 species of which 2 are new, namely *Aspidiotus socotranus* and *Furcaspis rufa*.

WAHL (B.). **Schnakenlarven als Pflanzenschädlinge.** [Tipulid larvae as pests of plants.]—*Mitt. k. k. Pflanzenschutzstation, Vienna*, n.d., 4 pp., 4 figs. [Received 27th April 1914.]

The larvae of TIPULIDAE, belonging to the genera *Tipula* and *Pachyrrhina*, the most abundant species being probably *Tipula oleracea*, are common pests in Austria. The plants most liable to attack are those which are low-growing, such as turnips, potatoes, peas, beans, lettuces, tobacco and ornamental flowering plants; also grasses and wheat, the damage being caused by the larvae feeding on the foliage.

Most TIPULIDAE have a single generation in the year; *T. oleracea* and a few other species have two or more. The adults are found during the summer, each female laying from 200 to 250 eggs or more on the earth. The legless larvae hatch in two to three weeks and at first feed in the soil, but later on living plants. They pupate in the earth towards the end of May and during June, the adult fly emerging two weeks later. Damage is particularly serious in marshy places, these affording the most suitable breeding grounds for the flies.

The use of mineral manures only, rotation of crops and good drainage

are recommended. Rolling destroys the larvae, and must be done when they are on the ground in the evening, early in the morning or on dull days. In marshy places very heavy rollers must be used; rolling also kills the pupae and the flies themselves when the latter rest on the ground, as is the case in dull weather. The larvae may be collected at night by artificial light and the adults can be caught with nets or light traps. Contact and stomach poisons are on the whole of little use, though good results are said to have been obtained by applying carbon bisulphide or benzene to the soil.

Urich (F. W.). **Froghoppers.**—*Jl. Bd. Agric. Brit. Guiana, Georgetown,* vii, no. 3, Jan. 1914, pp. 148-151.

After referring to the writings of Messrs. Bodkin, Quelch and Moore regarding the conditions in Demerara, the author says that only three species of froghoppers are common in the cane-growing districts, viz.:—The black froghopper, *Tomaspis pubescens*, which does not live on the cane, but only on certain grasses; the yellow-banded froghopper, *Tomaspis rubra*, which does not attack Gramineae at all, but lives on the Christmas bush (*Eupatorium odoratum*); and the yellow-sided froghopper, *Tomaspis flavilatera*. The last species is found on sugar-cane, but never in sufficient numbers to cause damage. It should, however, be watched and its natural enemies encouraged and protected as much as possible.

Bernard (Ch.) & Deuss (J. J. B.). **Control of imported Tea seed.**—*Qtrly. Jl. Scient. Dept. Ind. Tea Assoc., Calcutta,* iv. pt. 1, 1914, pp. 1-23. [Received 13th June 1914].

In the course of a paper dealing with experimental tests on the quality of tea seed imported into Java, the authors mention that the bad condition of seed has been attributed to mildew following on the boring of the hard shell by *Poecilocoris*. They are, however, doubtful whether this is really the case, as mildew occurs independently, and think that *Poecilocoris* influences the quality of the seed chiefly by absorbing the sap from the flowers and soft immature seeds.

Andrews (E. A.). **A Note on the relation between the Tea Mosquito** (*Helopeltis theivora*) **and the Soil**—*Qtrly. Jl. Scient. Dept. Ind. Tea Assoc., Calcutta,* iv. pt. 1, 1914, pp. 31-35. [Received 13th June 1914].

The author points out that though *Helopeltis theivora* is widely distributed throughout the tea districts of north-east India, it is only in certain places that it does considerable damage. A short account is here given of results obtained during recent experiments not yet concluded. The distribution of mosquito blight in the Duars is as follows: It is worst in the extreme west and towards the east in those gardens furthest from the hills. This is the area covered by the grey sandy loam of the Duars, the remaining area being almost entirely Red Bank; but in certain Red Bank gardens the mosquito is numerous. This distribution of the insect may be due to the Red Bank being a richer soil than the grey sandy loam, and the tea growing on it less liable to blight, the soil having deteriorated in those Red Bank gardens which are affected; or else there is some peculiarity in the grey loam which is gradually

being acquired by the soil of some of the Red Bank gardens. At first sight the former appears the more plausible explanation, but in the most blighted part of Cachar, the Hailakandy district, the tea on the teelas is on the whole less liable to blight than on the flats, and less on the stiff clay flats of the district than on the bheel; here the tea growing on the richest soil is more affected, and the soil on which the tea suffers least, i.e., the teela soil, is distinctly similar in chemical composition to the Red Bank of the Duars. This seems to point to a peculiarity which, if present in the grey sandy loam of the Duars, should be equally present in the bheel. This is found to be the case.

Tables are given of the available potash and phosphoric acid in five samples of each of the different soils mentioned, except in the case of blighted Red Bank gardens, where only one set of figures was obtained. From the results of these analyses the author concludes that, so far as at present observed, mosquito blight is found on tea planted in a variety of soils in which the actual and relative amounts of the constituents may be very different, but trees planted in soil with a low ratio of available potash to available phosphoric acid are less resistant than on soil in which this ratio is high. These observations suggest a possibility of influencing the susceptibility of tea to these attacks, by manuring in such a way as to alter this ratio.

Caesar (L.). **Insects attacking the Peach.**—*45th Ann. Rept. Ontario Fruit-Growers' Assoc.* (1913), *Toronto*, 1914, pp. 25-31, 6 figs.

The author deals with the chief insects attacking the peach, with special reference to the Peach Borer (*Sanninoidea exitiosa*, Say), which is most difficult to get rid of when once an orchard is infested with it. It also attacks plum, cherry and apricot, burrowing beneath the bark and partly or completely girdling the tree. The half-grown larva passes the winter beneath the bark, and in spring grows rapidly until about the end of June, when, being full grown, it leaves its tunnel and pupates on the outside of the bark or on the adjacent ground. About the end of July, the moths emerge and may be found from about August 1st to the end of September, laying their eggs on the trunks, branches and leaves, or on weeds close to the trees. These hatch in about 10 days and the larvae soon work their way into the soft inner bark. At first little brownish sawdust castings are thrown out where they feed, later, gum exudes, sometimes in large masses. There is thus but one brood in the year. Control is difficult, but besides digging out the larvae with a knife or wire, the author finds it a good plan to mound up the earth round the tree to a height of about 10 inches, which prevents the borers from boring into the crowns, as the point of attack is then near the top of the mound. This should be done about the end of July and the earth removed about the middle of October, replaced for winter protection, and removed again at the end of May. Wrapping with stout paper may be used as a substitute for the mounds. This should be about 18 inches in height and should begin from below the ground level, the earth being afterwards heaped about four inches above the base of the paper: the latter should be tightly tied at the top with a cord and loosely the rest of the way down. Tar-paper is often used, but may be injurious to the tree. The only two washes are ordinary gas tar and asphalt, the latter being the more satisfactory, as the

former has been known to damage trees. It is applied warm with a brush after removing the soil to a depth of 4 or 5 inches; the trunk should be covered to a height of about 6 inches above the ground level, applying a light coat first, followed by another when dry, so that it may be unbroken all round. This must be retouched each year, a heater being required to melt the asphalt and keep it liquid.

The lesser peach borer (*Synanthedon pictipes*, G. & R.) closely resembles the last insect and attacks the larger branches as well as the trunk, chiefly above the ground. The life-history is very similar, but the larva seldom enters except through a wound, so that digging out the larvae, when present, and careful pruning should prove effective means of control. Wounds should be cleaned with a knife and covered with white paint diluted with linseed oil. This insect also attacks cherry and plum trees.

The plum Curculio (*Conotrachelus nenuphar*) attacks the peach, plum, apple, pear, cherry and apricot, and the author has also seen gooseberries damaged by it. Soon after the fruit is set in spring and for a couple of weeks afterwards, the beetle makes crescent-shaped cuts on the fruit, in which it oviposits. The eggs hatch in about a week and the larvae work their way into the fruit, causing it to fall. In the fallen fruit the larva develops in about three weeks, and enters the soil to pupate, the beetle emerging about August and feeding on the peaches. With the advent of severe frosts, they hide among rubbish and long grass, etc., and orchards should always be kept free from such accumulations. The trees should be sprayed thoroughly with 2 or 3 lb. of arsenate of lead in 40 gallons of water when the fruit is about the size of a hazel nut, a little lime being added as a precaution against burning. Sulphur compounds or Bordeaux mixture cannot be used on peach trees after the leaves are out, as they will burn them. The only safe fungicide known is the so-called self-boiled lime-sulphur.

The fruit tree bark beetle or shot-hole borer (*Scolytus rugulosus*) bores holes through the bark, causing the exudation of gum. The beetles cannot remain in the galleries nor lay eggs in them, in healthy peach trees, because the gum drives them out, and they only attack weakly or dead trees and branches, in which they can breed. Plum, cherry, apple and pear are also regularly attacked. The winter is passed in the larval and pupal stages, and about June the beetles emerge, eating their way out, leaving shot-like holes in the bark. They then eat through the bark of other trunks and make a tunnel between it and the wood, in which they lay a large number of eggs; the larvae hatched from these make galleries at right angles to the main one, pupating at the end of them. In August the new brood of beetles emerges, no adults however surviving the winter. Usually the only control measure necessary is to watch the orchard, cutting down all dead and dying trees and branches, and burning these before the middle of May. Should the beetles be seen attacking a weak tree in the summer, they should be left to lay eggs there, and if this is then cut and pruned before the spring, the insects will thus be trapped. Painting the larger branches and trunk with a thick whitewash made of fresh lime and water, about $\frac{1}{4}$ lb. of ordinary salt being added to each pail, or heavy spraying of the trunk and branches in spring with lime-sulphur, are recommended.

San José scale (*Aspidiotus perniciosus*) can be controlled by a single thorough application of lime-sulphur, using 7 or 8 gallons of water to each gallon of the commercial wash. This should be done as early in the spring as possible, but after pruning, as then leaf-curl will be controlled also. The peach aphids are of two species, the green peach aphis (*Myzus persicae*) and the black peach aphis (*Aphis persicae-niger*); neither does any appreciable damage. The peach twig borer (*Anarsia lineatella*, Z.) does little injury in Ontario, but on the Pacific coast and in British Columbia it attacks the fruit as well as the twigs. The lime-sulphur spray used for leaf-curl usually controls it. The tarnished plant bug (*Lygus pratensis*) chiefly injures peach trees in nurseries by puncturing and destroying the buds, thus spoiling the shape of the trees. Those trees near grass and woods seem to be attacked most.

Rumsey (W. E.). **The Periodical Cicada** (*Cicada septendecim*, **L.**) **in West Virginia in 1914.**—*W. Virginia Crop Pest Commiss., Morgantown*, Bull. no. 4, March 1914, pp. 1-10, 3 figs.,1 plate.

The author says it is now known that there are two distinct races of cicada, one requiring 17 years and the other 13 years to complete their development. The former mainly occupies the north and north-eastern part of the United States, and the latter the south and south-western parts, though the two races often overlap. West Virginia has no broods of the 13-year race and attention is directed to the other race especially to Brood V (Marlatt) which will occur this year (1914) over the greater part of the State, a list of the counties concerned being given, also a map. The adult life is from 4–6 weeks, and the female lays between 400 and 600 eggs in June, making punctures in the twigs for the purpose; these hatch in from 6 to 7 weeks according to weather conditions. The newly hatched larva deliberately falls off the twigs on to the ground and enters the soil through a crack or at the base of the plant. It remains buried at a depth of 1 to 6 feet, feeding on the juices of roots, and undergoes all its ecdyses except the last underground. Towards the end of the metamorphosis the larvae gradually work their way upwards, the exits being usually finished by the end of April, and sometimes build up little clay tubes 2 to 4 inches high, keeping the exits open until they are ready to appear about the middle of May, the date again varying with the climate. The nymphs crawl up some object above the surface when the imago is ready to emerge. The damage done by cicadas is not great, except in the case of young or recently transplanted stock, and it is due to the punctures made in the bark of the twigs or the trunks, which furnish a nidus for the woolly apple aphis. The long subterranean and short aerial life makes it unlikely that there are many specific parasites or predaceous enemies, though several insects attack the eggs, while no doubt the larvae of many predaceous ground-beetles feed on the larvae in shallow ground. A fossorial wasp uses the adult to provision its cells and they are also destroyed in favourable weather conditions by fungoid diseases. Preventive measures are only practicable where there are a few trees which could be covered with mosquito or cheese cloth during the egg-laying period; young orchards should not be pruned in the winter or spring before the appearance of a cicada-brood, though pruning should

immediately follow the disappearance of the adult cicadas. Punctures not cut out in pruning should be protected with grafting wax or hard soap. Daily handpicking in the mornings or evenings, when the insects are sluggish, or spraying immature cicadas with kerosene emulsion do much good. Where orchards and nurseries are on new lands and near woods the worst damage may be expected, because the previous swarm used these timbered areas for oviposition. West Virginia is within the range of many broods of the 17-year race and consequently a swarm is present somewhere in the State every few years. Growers should keep themselves informed of these dates (another brood is due in 1915) and avoid planting orchards during the previous autumn.

Peairs (L. M.). **The Green Apple-Aphis and other plant lice.**—*W. Virginia Crop Pest Commiss., Morgantown,* Bull. no. 4, March 1914, pp. 11-16, 4 figs.

The author remarks on the predominance of the green apple-aphis, *Aphis mali*, F., on the apple trees of West Virginia, where it is an annual source of loss to fruit-growers. A description and life-history are given. Mention is made of the fact that the aphids can grow and reproduce at lower temperatures than the parasites which are their natural enemies, and this explains the great predominance of the aphids in the early summer, when much damage to the trees is done. A San José-scale or dormant spray should be used as near the end of the dormant season as will be safe, followed by a standard lime-sulphur wash. This will kill a large percentage of winter eggs or the early hatched young. It is necessary to cover the tips of twigs and branches thoroughly, and it is of little use to spray after the leaves are curled, as the aphids are then hard to reach and contact is necessary; then the best spray is a tobacco decoction. The undersides of the leaves must be sprayed and good pressure maintained. Tobacco extract may be included in the regular sprays applied about the time the leaves unfold (the "cluster-cup" spray), thus avoiding an extra spraying. Details are given of the preparations of home-made concentrated lime-sulphur wash and tobacco decoction, the former being for dormant spraying only. It is noted that arsenical sprays are useless for plant lice or aphids.

Essig (E. O.). **The Mealy Bugs of California.**—*Mthly. Bull. Sta. Commiss. Hortic. Sacramento, Cal.*, iii, no. 3, March 1914, pp. 97-143, 32 figs.

This well illustrated paper was written at the special request of the fruit-growers assembled at an emergency convention held at Ontario, Cal., 30th January 1914, at which the ravages by mealy bugs were given considerable attention. The author has collected all the information at present known about these pests, particular attention being given to the economic species. In the sub-family Dactylopiinae, there are several genera resembling the mealy bugs, but only the genus *Pseudococcus* (true mealy bugs) and one allied species in the genus *Ceroputo*, which is often confused with the former genus, are dealt with.

After giving an account of the differences between the sexes, the methods of reproduction and development, and the general bionomics

of these insects, a list of species, both economic and non-economic, is given with their host-plants. The following species are described with details regarding their colour, eggs, filaments, etc.

*Pseudococcus affinis*, Mask., (tuber mealy bug). Recorded in California as attacking *Anemone* sp. It occurs in Australia and was most probably imported on its host-plants, viz., the tubers of dahlias and potatoes.

*P. agrifoliae*, Essig, (coast live oak mealy bug). So far this species has only been found feeding on the tender bark on the edges of wounds under the rough outer bark of the coast live oak (*Quercus agrifolia*).

*P. andersoni*, Coleman, on *Cupressus goveniana* and incense cedar, *Libocedrus decurrens*.

*P. artemisiae*, Essig, (Artemisia mealy bug). Feeds on the bark above or just below the ground of the California sage (*Artemisia californica*) and upon the roots of *Senecio* sp.

*P. aurilanatus*, Mask., (golden or Araucaria mealy bug). Found on the smaller stems of the monkey puzzle (*Araucaria bidwillii*) the Norfolk Island pine (*Araucaria excelsa*), *Dammara ovata* and *D. vitiensis*.

*P. azaleae*, Tins., (azalea mealy bug). Taken upon *Azalea* sp. in a single Japanese nursery at San José, Cal., and probably imported from Japan.

*P. bakeri*, Essig, (Baker's mealy bug) recently called walnut mealy bug. Food-plants are varied and gradually increasing in number. They include the following: lemon (*Citrus medica limon*), orange (*Citrus aurantium*), pear (*Pyrus communis*), potato (*Solanum tuberosum*), Japanese quince (*Cydonia japonica*), walnut (*Juglans regia*), and willow (*Salix* sp.), and other plants of less economic importance. This species is a native one and is doubtless checked by natural enemies, but its presence should be carefully watched and control measures adopted on its becoming an economic factor.

*P. citri*, Risso, (citrus mealy bug), on the following:—Citron (*Citrus medica genuiana*), coffee (*Coffea arabica*), cotton (*Gossypium* sp.), grape (*Vitis vinifera*), Guadaloupe Island palm (*Erythea edulis*), lemon, orange, pomelo (*Citrus decumana*), pumpkin (*Cucurbita pepo*), redwood (*Sequoia sempervirens*), tobacco (*Nicotiana tabacum*), besides a great variety of other cultivated plants. It probably has a wider distribution in the State than any other species—the distribution in Southern California is shown on a map—and is of great economic importance, though since 1910, when much work was done upon it, there has been a general decline in its attacks.

*P. crawii*, Coq., (white sage mealy bug). The food-plants are the Californian sage (*Artemisia californica*) and white sage (*Ramona polystachya*).

*P. cupressi*, Colm. Occurs only on the Monterey cypress (*Cupressus macrocarpa*); the young feed principally about the bases of the cones.

*P. dudleyi*, Colm., (Dudley's mealy bug). Taken only on *Cupressus macnabiana*.

*P. ephedrae*, Coq., (Ephedra mealy bug) found on *Ephedra californica*.

*P. hymenocleae*, Ckll. The food-plant is Californian sage (*Artemisia californica*); the author thinks this may prove to be synonymous with *P. artemisiae*, Essig.

*P. adonidum*, L., (*P. longispinus*, Targ.) (longtailed mealy bug). This insect is both a greenhouse and outdoor pest, particularly on Dracaenas, also attacking the following:—Citron, *Croton* sp., fig, Guadaloupe Island palm (*Erythea edulis*), guava (*Psidium* sp.), lemon, lobster cactus (*Epiphyllum* sp.), mango (*Mangifera* sp.), *Opuntia* sp., plum (*Prunus domestica*), sago palm (*Cycas revoluta*), and many other cultivated plants. It is found generally throughout the State in greenhouses and ornamental gardens.

*P. maritimus*, Ehrh., (ocean mealy-bug) found hitherto only on the roots of *Eriogonum latifolium* at Santa Cruz.

*P. obscurus*, (obscure mealy-bug) found on roots of cactus (*Opuntia* sp.) at Boyle Heights, Los Angeles.

*P. pseudonipae*, Ckll., (Kentia mealy-bug) on Kentia palm (*Kentia* sp.) and coconut palm (*Cocos nucifera*).

*P. quercus*, Ehrh., (interior live oak mealy-bug) on leaves and in cracks of the bark of the "maul" or interior live oak (*Quercus chrysolepis*).

*P. ryani*, Coq., (cypress mealy-bug) infests Chinese arbor-vitae (*Thuya orientalis*), Monterey cypress (*Cupressus macrocarpa*) and Norfolk Island pine (*Araucaria excelsa*).

*P. salinus*, Ckll., (grass mealy-bug), found on grasses.

*P. sequoiae*, Colm., (redwood mealy-bug), so far found on the redwood (*Sequoia sempervirens*).

*P. solani*, Ckll., (solanum mealy-bug) is found usually underground or on branches which touch the ground, on potato (*Solanum tuberosum*) and tomato (*Lycopersicum esculentum*), besides other plants.

*P. yerba-santae*, Essig, (Yerba Santa mealy-bug). Abundant on leaves of Yerba Santa or mountain balm (*Eriodictyon californicum*).

*Ceroputo yuccae*, Coq. This species is included because of its great resemblance to mealy bugs. At present it is not economic, but may become so at any time. Found on roots, stems and foliage of: Banana (*Musa sapientium*), lemon (*Citrus medica limon*), lime (*C. medica acida*), *Yucca australis*, *Y. filifera*, *Y. whipplei*, and many other plants.

Of the natural enemies of mealy-bugs two internal parasites are described, *Chrysoplatycerus splendens*, How., which is figured, and *Leucopis bella*, Loew. Of the predaceous enemies, the Coccinellids, the larvae of many of which are covered with white filaments and are therefore not unlike the mealy-bugs themselves, are the most important, and the following are figured and their life-histories detailed:—

*Cryptolaemus montrouzieri*, Muls. *Cryptogonus orbiculus*, Schön., a smaller species introduced in 1910 from the Philippines; the larvae prey principally on the eggs and young mealy-bugs. *Chilocorus bivulnerus*, Muls., is a native species. *Hyperaspis lateralis*, Muls., is widely distributed in the State, the larvae attack mainly native mealy-bugs, but are frequently victims to an internal parasite which lessens their effectiveness. *Scymnus guttulatus*, Lec., is a native species and often does very valuable work. *S. marginicollis*, Mann., feeds on many other scale-insects besides mealy-bugs. *S. nebulosus*, Lec., preys on mealy-bugs, other scale-insects and plant lice. *S. sordidus*, Horn, resembles the last species in its habits. *Rhizobius ventralis*, Er., intro-

duced by Albert Koebele, feeds on the citrus mealy-bug in Ventura county. *Lindorus lophanthae*, Blaisd., resembles *Scymnus marginicollis* ; introduced by Albert Koebele and distributed throughout the Southern State.

Other enemies include the larvae of *Chrysopa californica*, Coq., (the green lacewing), *Sympherobius augustus*, Banks., (the brown lacewing), which is however itself preyed upon by an internal parasite (*Isodromus iceryae*, How.), and *Baccha lemur*, O.S., a Syrphid fly, which feeds extensively on *Pseudococcus yerba-santae*, Essig, and with *Leucopis bella*, probably keeps that mealy-bug in check.

The cottony, waxy material secreted by mealy-bugs renders them resistant to all insecticides but those of the oil-emulsion type. This covering also assists them in resisting fumigation. The spray found to be most efficient in killing mealy-bugs, causing the least damage to fruit and foliage and also the least expensive, was as follows :—Water 33⅓ imp. galls., whale-oil soap 40 lb., crude carbolic acid 4 imp. galls. The water is brought to boiling point and the soap, chopped into small pieces, is thoroughly dissolved in it, the carbolic acid is then added and the whole boiled for 15 minutes. The resulting mixture should be a thick light creamy emulsion. For orchard use add 1 gallon of this stock to every 20 gallons of water, the resultant spray being milky-white in colour. The author had considerable difficulty in finding the best quality of each ingredient, and finally found the most satisfactory whale-oil soap to be rather light in colour and easily dissolved in hot water, while the best carbolic acid (about 25 per cent. pure) was rather thin and did not greatly colour the stock solution ; with other qualities it was impossible to get a good emulsion. The commercial sprays on the market have not been tested by the author, their great cost is an objection to using them on a large scale, but small infestations can be treated with less trouble in this way. The best time to spray mealy-bugs appears to be during the autumn, winter or spring months, when eggs are being laid and young are hatching, the trees being also dormant and better able to withstand the effects of the sprayings. The sprayer should be capable of maintaining a pressure of from 150-200 lb., and the liquid applied as a coarse driving spray, the best nozzles being the large-holed " Jumbo " and " Mistry Jr." A spraying rod equipped with a straight " Y " and two angled nozzles or an angled " Y " and two straight nozzles are recommended. The amount of liquid used for an average tree (15 gallons) will cost only about 3½*d.* In severe infestations, the author made such an application as many as five times—without any apparent damage to the trees. With fumigation it has been found that a repetition of small doses gives as good results with less damage to the trees as the extensive doses thought necessary in the first instance. For example, the author obtained good results by using ¾ schedule No. 1 (potassium cyanide), making a second charge at the end of the first hour, the entire exposure two hours. Mr. Weinland reports that the best results were obtained by using ½ schedule No. 1 (sodium cyanide) under the same system. It is considered that, on the whole, fumigation is a more satisfactory and efficient method than spraying.

The paper concludes with some remarks on the importance of carrying out quarantine regulations and gives notes on methods of fumigating nursery stock, etc.

Childs (L.). **Oak Pests—The Oak Twig Girdler** (*Agrilus politus*, **Say**). —*Mthly. Bull. Sta. Commiss. Hortic., Sacramento, Cal.*, iii, no. 3. March 1914, pp. 150-155, 3 figs.

The author points out that the live oaks (*Quercus agrifolia*) throughout California are subject to many insect pests, of which this paper is a preliminary account. The presence of the twig girdler (*Agrilus politus*), a Buprestid beetle, is easily detected on the smaller twigs, and where the infestation is severe and of long standing, the vigour of the trees is greatly reduced. The larvae generally work upon branches which are about the size of a lead pencil and less than ½ inch in diameter, in which they make spiral galleries destroying the cambium layer and killing the twig. The cause of the trouble can easily be determined by cutting away the bark of one of the dead twigs, taking care not to miss the larva which is slender and will be found at a point near the union of the dead and living wood ; the furrow will be obvious. Little is known of the different stages of development, but from various collecting dates recorded in different years it appears that the adults may appear as early as April, but more usually in June. The time of appearance of the adult is an important factor in the control of the pest, which should be undertaken during autumn and winter when the larvae are nearly mature. The best method consists of thoroughly cutting out infested parts and burning them at once. Observations made at Palo Alto for several years, seem to indicate that the beetle does not fly great distances, but for the most part lays its eggs in the tree in which it developed. Mention is made of a report from S. Nakayama, of Stanford University, on an undetermined hymenopterous parasite which attacks the larvae, but little is yet known of this insect.

Vosler (E. J.). **Calendar of Insects Pests.**—*Mthly. Bull. Sta. Commiss. Hortic., Sacramento, Cal.*, iii, no. 3, March 1914, pp. 162-156.

The citrus thrips causes a leathery distorted growth of the leaves and marks the fruit ; another species causes the leaves to become yellow and spotted and the fruit-rind silvery ; others feed on parts of the flowers. The U.S. Bureau of Entomology recommends the following spray : Commercial lime-sulphur (33 degrees), 2⅓ gallons ; black leaf extract, 2 gallons of 2¾ per cent. or 14 fluid ounces of 40 per cent., water 200 gallons. Maintain a strong pressure of about 175 lbs.

Fuller's rose beetle, *Pantomorus* (*Aramigus*) *fulleri*, attacks the new foliage of citrus trees and, as it is unable to fly, can be trapped by barriers placed round the stems, one type being a strip of cotton about four inches wide, tied with a string on the lower side of the band, which is then pulled down over the string so that it extends outwards a short distance. Tree tangle-foot may also be used. *Diabrotica soror* is another beetle which attacks the foliage of citrus trees. It may be controlled by shaking the beetles into a tarred or oiled screen in the early morning, and by poisoning them by spraying with arsenate of lead, 2 lb. to 50 gallons of water.

The cottony cushion scale, *Icerya purchasi*, is a pest of *Citrus* as well as of apple, peach, apricot, fig, walnut, acacia, etc., and is usually

held in check by the Australian Coccinellid, *Novius cardinalis*, supplied by the State Insectary.

The peach borer, *Sanninoidea opalescens*, is rather limited in its distribution, being found in the Santa Clara Valley, Alameda and San Mateo counties, and slight infestations at Ventura and Riverside. It attacks chiefly the peach, apricot, plum, prune and cherry. The eggs are laid on the trunks a few inches above the surface of the soil and the newly hatched larva bores through the bark. The exuding gum indicates the presence of the larvae, which remain in their burrows during the winter months. Control methods include the use of the resistant Myrobolan cherry-plum as a stock, protective washes of some crude oil mixture, lime-sulphur-salt mixture, digging out the worms or killing them with a crooked wire. The use of hard asphaltum, grades C and D, applied warm to the tree-trunks from 5 to 6 inches below and above the surface of the soil with a brush, has been recommended. Two coats are put on, preventing the entrance or exit of many of the insects. The eggs of the brown day moth, *Pseudohazis eglantereina*, Boisd., are salmon coloured and laid in clusters around the small twigs in early spring ; these should be destroyed and arsenical sprays used, when the larvae are numerous enough to do much damage. They are voracious feeders on various fruits and bushes. Mention is also made of the rose aphis, which a soapy solution of tobacco spray will easily destroy, and of the rose scale, found in all stages throughout the year infesting rose, raspberry and blackberry canes. The eggs are hard to kill and successive sprayings with kerosene emulsion are necessary to control it. Badly infested canes should be cut out and burned.

The raspberry horntail, *Hartigia cressoni*, is a sawfly, the larvae of which burrow into the canes of the raspberry, blackberry, rose and loganberry. The winter is spent in the larval and resting stages within the canes, adults emerging in April. The eggs are inserted in the tips of young shoots and soon hatch. Having killed the tips the larvae make their way down into the canes. Control may be attempted by destroying the soft eggs by slight pressure before they hatch, and cutting out infested canes.

The larvae of the strawberry crown moth, *Aegeria rutilans*, work within the stems near the base or roots of the host. The roots and canes of raspberries and blackberries are sometimes attacked, the adult laying its eggs soon after emerging in April. In irrigated districts infested fields should be submerged for four or five days after the crop is harvested.

**Insect Notes.**—*Mthly. Bull. Sta. Commiss. Hortic., Sacramento, Cal.*, iii, no. 3, March 1914, p. 168.

G. P. Weldon reports that *Anarsia lineatella* (peach twig borer) was taken hibernating in the forks of almond trees at Paso Robles, Cal., on 21st January. The eggs of *Bryobia pratensis* (brown or almond mite) were also found abundantly near Banning on almond trees. A severe infestation of *Sanninoidea opalescens* (peach borer) was found recently in Riverside County, this being the first report of it in that county. *Tortrix citrana* (the orange tortrix) is

reported as doing considerable damage in parts of Orange County, visited on 4th and 5th Feb., and later at Pasadena.

WARREN (E.). **The Prickly Pear Pest.**—*Agric. Jl. Union of S. Africa, Pretoria*, vii, no. 3, March 1914, pp. 387-391, 2 figs.

This paper deals with the effect of the cochineal insect (*Dactylopius coccus*) upon the prickly pear. This plant is not indigenous to South Africa, but is becoming a serious problem owing to its abundance and disagreeable spines. A Commission appointed by the Queensland Government, which also has considered this plant a menace, found in Ceylon that prickly pear plants infested with cochineal insects became sickly. When in South Africa, this Commission gave into the charge of the Division of Entomology at Pretoria, for experimental purposes, a piece of stem of this plant infested with these insects. Experiments with these were carried out at the Natal Museum under charge of Dr. C. Akerman.

There are two species of prickly pear common in South Africa, a thin-stemmed long-spined species of a bright green colour, *Opuntia monocantha*, and a thick-stemmed short-spined species of a pale blue-green colour, *O. tuna*. In addition to these wild and useless species, certain spineless varieties of *O. anacantha* and *O. monada* are grown to a certain extent as cattle food for the dry season. The material for these experiments was received in June 1913, and only the first two species mentioned, were used as food-plants. *O. tuna* gave negative results, as the insects would not settle, and died after two days wandering; three other attempts to infest it meeting with the same result. On *O. monocantha* however they settled down and completed their life-history. There is no metamorphosis, and development is simply a matter of growth. Young individuals can crawl some distance—in one case as much as 10 feet—and on emerging from the envelope of the parent are of a dark brown colour, just visible to the naked eye. When full grown the insect may measure $\frac{1}{4}$ inch in diameter. The young grow to maturity in about 4 or 5 weeks and usually settle down permanently after about two days. For about 8 weeks the cactus stem showed no other symptoms of ill-health than to become yellow in patches around the cochineal insects, but after about 9 weeks the plants began to shrivel quite suddenly, and dried up in a very short time. The collapse was striking and appeared to indicate a poisonous effect of the Coccid. Plants growing in the Museum garden were next tried, with the same results, though there the growth of the insect was slower than in the laboratory. In August 1913, vigorous plants in two different localities near Pietermaritzburg were infected; the insects took good hold on the plants and portions of these at the time the author wrote (January 1914) exhibited marked symptoms of ill-health. It is considered that these insects may be of use in keeping the prickly pear within bounds; and should they stand the winter and no enemy arise, might become so abundant as to exterminate *O. monocantha*. In such a case, in districts where prickly pears are grown for cattle, a variety which is spineless and immune to the cochineal insect would be necessary. Probably it is more important to exterminate the long-spined species than to continue to grow that variety for cattle-food, should an immune variety be unobtainable.

Crawford (David L.). **A Contribution toward a monograph of the Homopterous Insects of the Family Delphacidae of North and South America.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, xlvi, pp. 557-640, 6 pls.

A very useful revision of the American members of this family, which contains a number of species that are of economic importance. The author recognises 22 genera and deals with 132 species, a large proportion of which are described for the first time.

**Per diffondere la** *Prospaltella* **contra la** *Diaspis pentagona.* [How to spread *Prospaltella* for the destruction of *Aulacaspis pentagona.*]—*L'Agricoltore metaurense, Fano*, x, no. 1, January 1914.

The Cattedra Ambulante of Fano gives notice that they will distribute in March, to interested persons who may ask for them, branches of mulberry covered with *Aulacaspis* (*Diaspis*) *pentagona* infected with *Prospaltella berlesei.* This branch should be sprayed with pure water and fastened with iron wire to any mulberry tree which may be seriously attacked by *Aulacaspis*, within twenty-four hours after receipt. A large tree should be selected, capable of furnishing at least 200 branches infested with *Aulacaspis* of the size of the one received from the Station, and the tree must not be treated in any way with insecticides or other dressings, nor must it be pruned until next year. In March of the following year, all the small branches of this mulberry tree are to be cut up into small pieces, and each of these should bear a very much larger quantity of *Aulacaspis* than that received from the Station. These pieces are to be used in the same way as the original branch, and it is stated that in two years the mulberry trees will be completely freed from *A. pentagona.* Landowners and farmers are earnestly requested to examine their mulberry trees, and to do all they can to assist in spreading *P. berlesei.*

**Бюллетень о вредителяхъ сельскаго хозяйства и мѣрахъ борьбы съ ними.** [Bulletin on the pests of agriculture and methods of fighting them.]—*Entomological Bureau of the Zemstvo, Charkov*, 1914, Bull. no. 1, February 1914, 27 pp.

Averin (V. G.). **Объ ожидаемомъ появленіи вредителей въ 1914 году.** [On the expected appearance of pests in 1914.] pp. 1-6.

The author's remarks are based on observations and data collected during 1913. An outbreak of *Aporia crataegi* may be expected in some districts of the government, although last year some 40 per cent. of the caterpillars and pupae perished from pebrine and parasites. The Central and Western parts of the government must expect large numbers of *Cydia pomonella*, which yearly does more and more damage, so much so that the author thinks that in the near future all the orchards will be infested and only the absence of apples will then stop its further development. Only 30 per cent. of caterpillars and pupae of *Hyponomeuta malinellus* were destroyed last year by parasites, so this pest may again appear everywhere. The same is also the case with regard to *Anthonomus pomorum*, which last year destroyed in some orchards 30–40 per cent. of the yield, while in others this figure reached 60 per cent., notwithstanding the fact that 63 per cent. of its

larvae suffered from parasites. *Psylla mali* and *P. pyricola* are a serious scourge in some parts and increase from year to year. *Aphis mali* and other species of plant lice may also be expected.

As the time of appearance of *Euproctis chrysorrhoea*, *Lymantria dispar* and *Malacosoma neustria* had passed, no outbreaks of these pests were expected in the near future; various parasites play a prominent part in checking the spread of them. The larvae of *Melolontha melolontha* and *Melolontha hippocastani* have done increased damage, especially in the central and eastern districts of the government. The sawflies, *Eriocampoides limacina*, Retz., (*Eriocampa adumbrata*, Klug), *Ardis* (*Selandria*) *bipunctata*, Klug, *Pteronus* (*Nematus*) *salicis*, and *Pteronus ribesii*, Scp., (*Nematus ventricosus*) and the mite *Eriophyes* (*Phytoptus*) *pyri*, Pgst., may also appear in more or less large numbers in various parts of the government.

As to pests of market-gardens, attention is called to *Gryllotalpa gryllotalpa*, *Chortophila brassicae*, Bouch., *Hylemyia antiqua*, Meig., *Pieris rapae*, L., and *Barathra* (*Mamestra*) *brassicae*, L. All these did considerable damage in various localities last year, where they may be expected again; *Chortophila brassicae* has from 3 to 5 generations in the government, while *Hylemyia antiqua* has from 2 to 3 generations, so that serious trouble may be expected in districts where they appeared last year.

Field crops must be protected against *Trachea* (*Hadena*) *basilinea*, *Pyrausta nubilalis* (*Botys silacealis*) and *Barathra brassicae*, which did considerable damage to beet last year, only a small number of the caterpillars and pupae having perished from fungus disease and parasites, and also against *Phlyctaenodes* (*Eurycreon*) *sticticalis*, L. The author refers to the "diapuse" [see this *Review*, Ser. A, i, pp. 495 and 497] observed last year occurring in the last-named pest and to the beneficial results which this had on beet plantations, which were able to recover from the damage done by the caterpillars of the first generation. The "diapuse" last year affected partly the caterpillars of the first generation, about 5–8 per cent. of which remained in the cocoons without pupating, and the moths of the second generation, which remained infertile; the author therefore thought that no large numbers of this pest were to be expected in the spring of this year.

Averin (V. G.). **Текущія работы въ февралѣ.** [The current operations in February.] pp. 6-8.

The author recommends destroying in orchards the winter nests of *Aporia crataegi* and *Euproctis chrysorrhoea* and the egg-masses of *Lymantria dispar* and *Malacosoma neustria*. He figures the nests of both the former and the eggs of both the latter pests.

Rjaboy (D. D.). **Собирайте гусеничныя гнѣзда.** [Collect the nests of caterpillars.] pp. 8-10.

This is a well written appeal to fruit-growers to destroy the winter nests of *Aporia crataegi* and *Euproctis chrysorrhoea*; the author illustrates from his observations the damage done by the pests and mentions that one orchard of an area of 1⅓ acres, which gave in 1912 a yield worth £50–£55, was in 1913 rendered leafless by the caterpillars of these pests.

Averin (V. G.). **Къ вопросу о направленіи работъ энтомологическаго бюро въ 1914 г.** [On the direction of the work of the Entomological Bureau in 1914.] pp. 14-16.

The author refers to the recommendations on this subject of the first All-Russian Congress of Applied Entomology in Kiev in September last, and says that in accordance with these recommendations, the principal work of the Charkov bureau will consist in aiding the population to fight the various pests and in practical experiments on various remedies that have been recommended.

Valch (B.). **Къ свѣдѣніямъ о массовомъ появленіи тополевой моли въ 1913 г.** [Notes on the outbreak of *Lithocolletis populifoliella*, Fr., in 1913.] pp. 16–17.

The second generation of *Lithocolletis populifoliella* Fr., [see this *Review*, Ser. A, i, p. 495] was more numerous than the first one, notwithstanding that 35–40 per cent. of the latter were infested by parasites. In August, most of the poplar trees in Charkov were devastated and the plague spread along the railway line as far as the station of Meref; it was noticed that the poplar trees situated along the line have suffered most, the damage disappearing totally at a distance of 600 yards from the line; solitary trees or isolated avenues have also suffered more than dense groups of trees, which sometimes were not affected at all. The greatest injury was done to "balsam poplar" (*Populus balsamifera*), the least to "silver poplar"; the first generation did not attack the latter trees at all and even the second one attacked them only where all the other varieties of poplar were overcrowded with caterpillars. Besides poplar trees, the pests attacked also some varieties of willow, but the caterpillars on the latter usually perished without becoming adult. The second generation appeared on the 28th August, but in the middle of September some of the moths had not emerged and even adult caterpillars were still found. The second generation was infested with parasites to the extent of 98 per cent., most of them being ectoparasites. The author has noticed that the caterpillars get into cracks of the bark, and recommends smearing the trees in late autumn or early spring with "wolf's paste" as a preventive measure.

Lafforgue (—). **Traitement d'hiver des parasites de la vigne.** [Winter treatment of vine pests.]—*Rev. Vitic., Paris*, xli, nos. 1054 & 1055, 26th Feb. and 5th Mar. 1914, pp. 225-232 & 259-263.

*Haltica*, *Clysia ambiguella*, *Polychrosis botrana*, *Sparganothis* and Coccidae are the insects the winter treatment of which is discussed. One method is directed against the sites of hibernation by using shelter traps or undertaking decortication. The other method includes washing with insecticides or hot water and fumigation, and aims at destroying the pests *in situ*. If shelter traps are used against *Haltica* they must be placed not later than August; natural shelters (bushes, grass, cracks in the ground, etc.) must be eliminated and the area under treatment must be as extended as possible. The latter conditions can only be satisfied

where a number of vineyards are situated together and their respective owners agree to practise control. In the case of *Clysia* and *Polychrosis*, the traps must be placed on the vine stocks in order to stop the caterpillars before they can reach the bark of the old wood. Another method in favour in South Tyrol, consists of wrapping strips of cloth, 10 to 12 inches long by 4 to 5 inches wide, at the base of the branches and on two-year-old wood. The quality of the cloth is immaterial provided it is odourless. This method is valuable because it permits the destruction of a large number of *Clysia* and *Polychrosis* pupae, but spares their parasites to a certain extent. The proper time to remove these traps will be indicated by the moths themselves. A too early removal will entail the destruction of the useful parasites and one that is too long delayed will permit the moths to emerge. The best system is to inspect daily those traps which are in sunny situations, protected against wind. When the first moths appear all the useful insects will have left the traps. The strips must be placed in position before the caterpillars of the second generation (*Clysia*) or of the third generation (*Polychrosis*) have reached the adult state. Such traps are also useful against *Sparganothis* and, in this case, should be used much earlier, usually early in August. If properly executed, decortication is a certain remedy, but it must be complete, and the work must be done in mid-winter and after pruning, the débris being collected and burnt. Care must be taken not to touch the young bark still adhering to the trunk. The cost works out at about 22*s*. per acre or less, according to the number of stocks. This is not expensive when it is remembered that the effects last for 3 or 4 years and also involves the destruction of scale-insects. The work is rendered much easier if a 10 per cent. solution of sulphuric acid be applied to the stocks, as the bark is then more easily removable. The gravest objection to decortication is that the stripping off of the bark leaves the vines ill-protected against the cold. Sluicing with hot water, when applied immediately after the grape harvest, appears to kill a large number of *Clysia* caterpillars. In 1900, Laborde ascertained that *Clysia* pupae in their cocoons are destroyed by a temperature of 131° Fahr. maintained for 15 seconds. With *Polychrosis* pupae, Feytaud and Capus found that 1 minute at 113°–122° Fahr., 30 seconds at 128° Fahr., and 20 seconds at 131° Fahr., are sufficient to cause death, which is instantaneous at 158° Fahr. The experiments conducted at the Montpellier school by G. Verge during the winter of 1910–11 are most valuable from a practical point of view. The water is taken at a temperature of 212° Fahr. from an ordinary boiler and put into a container of 14½ pints capacity for distribution purposes. This container stands on a tripod and is fitted with a heater which maintains the temperature nearly at boiling point, so that the water reaches the vine-stock at about that degree of heat. Careful thermometric measurements prove that the water penetrates to the deepest bark at 198° Fahr. Two plots, each containing 12 stocks, were used in the test. In the first, each stock was treated with 2¾ pints of water and a mortality of 87 per cent. resulted, 95 pupae being killed out of 109. In the second, 4 pints were applied and the mortality reached 97 per cent., 99 pupae dying out of 103. In the laboratory experiments referred to above, Laborde obtained a percentage of 77 to 100 and Feytaud, 80 to 88. At the time of Verge's test (the 23rd of

November), the *Clysia* pupae were nearly all fully formed and in their cocoons. There can, therefore, be no doubt of the efficacy of the process, provided that care be taken to use boiling water and to operate in dry weather immediately after the grape harvest, so as to find some *Clysia* still in the larval stage. The best method is to pour the water gently on the branches so as to let it run down the trunk, care being taken not to touch the sensitive new wood. The hot water treatment is specially useful against *Sparganothis*, provided the stakes are also treated so as to destroy the insects sheltering in cracks. Fumigation of the stocks, enclosed in a suitable cover, with burning sulphur will free the vine from *Sparganothis* in 10 to 12 minutes, but is not efficacious against either *Clysia* or *Polychrosis*. Whitewashing with insecticides is only suitable for the treatment of Coccids. The Hubbard-Riley emulsion is made up of 1 lb. hard soap, petroleum $17\frac{1}{2}$ pints, boiling water $8\frac{3}{4}$ pints. The soap is first dissolved in the hot water, then the petroleum is added and the mixture is stirred for 5 or 10 minutes. The various liquids must be hot and the water soft if good results are to be obtained. This solution is diluted with 10 to 20 parts water for use. In the Gironde, a thick milk of lime (44 lb. quicklime in 24 gals. water) is employed. On drying, this wash encloses the scales, fixes them, prevents the young from emerging and also kills them by dehydration. To destroy moths which issue from caterpillars brought to the cellars, the cellar should be kept locked from the beginning of April and light only allowed to enter by an opening the size of a window-pane. This aperture is closed by a transparent sheet of paper covered with a sticky substance on which the moths are caught when they fly towards the light. The author in conclusion suggests that decortication be carried out in the first year, followed by shelter traps in the second, third and fourth years, beginning the cycle anew in the fifth year. Concerted action of all growers in a given district is indispensable. The compensation now paid to individual sufferers should be abolished, and Agricultural Defence organisations placed under the Act of 1888, so that if a majority be in favour of control, the few dissentients can be forced to practise it. The money now given in compensation would be better applied in aid of such organisations. The author emphasises the necessity of operations on a large scale if winter treatment is to be effective.

Harrer (—). **Kultur der Kokospalme in Deutschostafrika.** [Cultivation of the Coconut palm in German East Africa.]—*Naturwiss. Zeits. Forst. Landwirtsch., Stuttgart*, xii, no. 3, March 1914, pp. 128-132.

An important insect enemy of coconut palms in German East Africa is the weevil, *Rhynchophorus phoenicis*, which bores into the young palm, eating the leaves while they are still folded and greatly hindering the growth. The adults are gathered by hand from the palms, children being employed for the purpose and receiving about 10*d.* for every 100 weevils.

Foussat (J.). **Bouillies anticryptogamiques et insecticides employées en Viticulture.** [Spraying liquids for cryptogamic and insect pests in vine cultivation,]—*Bull. Agric. Algér., Tun., Maroc, Algiers*, xx, no. 6, March 1914, pp. 177-191.

The two most serious pests of vines in Algeria are mildew and

*Haltica ampelophaga.* Although the latter has practically disappeared from most regions in Algeria, it is still necessary to combat it to prevent its undue multiplication. As soon as the first flea-beetles appear, arsenical or other poisonous sprays must be applied without delay, many of these sprays being also efficacious in killing *Polychrosis*, which caused serious damage at Rouïba in 1913. Nicotin spray is prepared from the concentrated juice of tobacco, 1 lb. of the extract being dissolved in 100 gallons of water. Arsenical sprays are made up with either the arsenite or arsenate of soda, 4 to 5 lb. to 500 gallons of water. Arsenate of lead solutions are prepared by dissolving 2 lb. of anhydrous sodium arsenate in 25 gallons of water; to this is added a solution made by dissolving 6 lb. of lead acetate in 75 gallons of water; the action of the spray is increased by adding from a half to 1 lb. of soft soap. Arsenate of copper solution is prepared by adding a solution containing 2 lb. sodium arsenate to one containing 4 lb. copper sulphate, lime being added to neutralise the solution. Copper arsenite may be prepared by mixing solutions of sodium arsenite and copper sulphate; the sodium arsenite may be obtained in commerce, but for those who prefer to prepare it afresh from arsenious acid, the following details are given: in 2 gallons of boiling water dissolve 2 lb. carbonate of soda, and add by degrees, 2 lb. arsenious acid; boil for $\frac{3}{4}$ of an hour; the copper sulphate solution is prepared by dissolving 2 lb. of the salt in 10 gallons of water; the solution of lime for neutralising is prepared by adding 2 lb. of lime to 10 gallons of water. When required for use, one part of the sodium arsenate solution is added to 50 parts of the copper sulphate; the mixture is stirred, and to it is added 50 parts of the lime solution.

VIVET (E.). **Vignobles attaqués par la Cétoine velue.** [Vines attacked by *Epicometis hirta*, Poda.]—*Bull. Agric. Algér., Tun., Maroc, Algiers*, xx, no. 6, March 1914, pp. 191-192, 1 fig.

Vines at Rivet, Maison-Blanche, Desaix, Aïn-Bessem, etc., were attacked early in April by large numbers of *Epicometis hirta*, Poda (*E. hirtella*, L.), which devours the buds and young grapes. The period during which the damage is done is short, the beetles leaving the vines as soon as other flowers open on which they can feed. Hand-picking, as soon as the insects appear, and the use of arsenical sprays are advocated; this also kills the flea-beetle which make its appearance about this time.

HOLLRUNG (M.). **Gedanken über einige neuzeitliche Erkrankungen an tropischen Nutzgewächsen.** [Review of recently observed diseases of tropical cultivated plants.]—*Der Tropenpflanzer, Berlin*, xviii, no. 3, March 1914, pp. 136-148.

This paper is a brief review of the more recently discovered diseases caused by insects and fungi on tropical cultivated plants.

MORSTATT (H.). **Kaffeekultur, Kaffeeschädlinge und andere schädliche Insekten im Bezirk Bukoba.** [Coffee cultivation, coffee pests and other injurious insects in the province of Bukoba.]—*Der Pflanzer, Daressalaam*, x, no. 3, March 1914, pp. 133-141.

Coffee cultivation in Bukoba is facilitated by the fact that there are

very few insect pests; the young trees have only on rare occasions had to be replanted owing to damage done by insects, and older trees have suffered but slightly in any part of the district. Stored coffee is attacked by the Scolytid, *Stephanoderes coffeae*, Haged., though the berries on the trees appeared quite free from the insect. The same beetle has recently been recorded from Amani, where it was found on other plants, notably on wild blackberry, but not on coffee. Gowdey noticed that Arabian coffee was less often attacked than other varieties, an observation that was made also by the author when dealing with the stored berries obtained in Bukoba. The coffee borer, *Dirphya* (*Nitocris*) *princeps*, Jord., is occasionally found on Arabian and the so-called Guatemala coffee. The bug, *Antestia variegata*, var. *lineaticollis*, has been observed on Guatemala coffee and a species of *Calidea* on Arabian coffee, but it is doubtful whether they are harmful. Various scale-insects have been found, which have sometimes been present in numbers large enough to do serious damage to young trees; the most common is *Pulvinaria psidii*, Mask., which has been also observed on coffee in Uganda. *Ceroplastes ceriferus*, And., and *Coccus* (*Lecanium*) *viridis* also occur. Leaf miners are rare; *Ceratitis capitata*, Wied., which is common in Uganda, has so far not been found in Bukoba. The only species of termite that is harmful is *Termes bellicosus*, which sometimes destroys the very young plants.

A few pests have been observed on cotton in the Nyassa-Upland plantation, near Kifumbiro. The worst of these is probably the pink boll-worm, *Gelechia gossypiella*. The bugs, *Dysdercus fasciatus* and *D. nigrofasciatus*, are common; and also *Phonoctonus fasciatus*, which must be regarded as useful, as it preys upon the other two species. The buds of cotton are frequently attacked by species of *Mylabris*. A species of *Xyleborus* is recorded as damaging the plants by eating into the young shoots and causing them to dry up.

MORSTATT (H.). **Die wichtigsten chemischen Mittel des Pflanzenschutzes.** [The most important chemical methods of protecting plants.]—*Der Pflanzer, Daressalaam*, x, no. 3, March 1914, pp. 144-149.

The paper gives a brief summary of the more important chemical compounds used to protect cultivated plants from insects and disease. Petroleum is recommended as a contact insecticide against bugs, grasshoppers, beetles, caterpillars, etc.; insects collected by hand are readily killed when dropped into a wide-mouthed vessel containing a mixture of water and petroleum. For spraying, the following solutions are recommended: from $\frac{1}{2}$ to 3 per cent. soap solution; against Aphids and small insects the solution should be weaker than against larger insects. Petroleum and soap emulsion against Aphids, beetle larvae and caterpillars: $2\frac{1}{2}$ lb. of soap to be dissolved in half a gallon of hot water and mixed with 2 gallons of petroleum until a uniformly milky solution is obtained; this is added to 1 gallon of hot water and the whole is diluted with 100 gallons of cold water. Tobacco mixture is used against Aphids, scale-insects, leaf-eating beetles and their larvae, bugs, etc.; 3 or 4 dried tobacco leaves and stems are cut up and boiled in 10 gallons of water and left standing for 24 hours; 10 to 20 lb. of soap are dissolved in 4 gallons

of hot water and mixed with the tobacco solution; the whole being diluted with 100 gallons of water. A mixture of 1 lb. of sodium arsenate with 10 lb. of sugar or molasses and dissolved in 100 gallons of water, even in dilute solutions, tends to burn the foliage of the plant; but prepared as above may be used against all insects that devour the leaves. Schweinfurt green mixed with equal weights of lime and water is a powerful poison which does not injure the plant; or it may be mixed dry with 20 times its own weight of meal, lime, or gypsum and powdered on the plants. Poisoned bait may be prepared as follows: (1) meal is mixed with 1 per cent. Schweinfurt green and damped with water; (2) for use against terrestrial larvae, 1 lb. of sodium arsenate is dissolved with 6 lb. of sugar in 12 gallons of water; this solution is used to damp chopped grass, which is strewn round the plant; (3) 1 part Schweinfurt green is mixed with 2 parts of salt or with 4–5 parts of sugar and enough water to make a thin pulp.

Heikertinger (F.). **Zoologischen Fragen im Pflanzenschutz.** [Zoological questions in the protection of plants.]—*Centralb. Bakt. Parasit. u. Infektionskrank., Jena,* xl, no. 11-13, 2nd March 1914, pp. 284-299.

The zoological questions referred to in the title are confined to those of nomenclature. The author urges the importance of recording insects under the most recently accepted name. The latter part of the paper deals with a general classification of phytophagous insects.

Lesne (P.). **Insectes nuisibles aux arbres fruitiers.** [Insects injurious to fruit trees.]—*Jl. d'Agric. Pratique, Paris,* xxvii, no. 10, 5th March 1914, pp. 307-311, 1 pl.

*Oxythyrea funesta,* Poda, (*Cetonia stictica,* L.) frequently occurs on roses and fruit-blossoms, especially those of pears, which it attacks as soon as they open, devouring the stamens, and is sometimes a serious pest in the South of France. The larva is a small, white, slightly hairy grub, which lives in leaf-mould and sometimes abounds in hot beds where it can be controlled with gelatine capsules of carbon bisulphide. Heaps of dead leaves near the orchard may also become centres of infection. The imagines may be shaken off the trees on to a sheet, at a cool time of day. *Epicometis hirta,* Poda, is a nearly allied species, but slightly larger and covered with erect hairs, which sometimes does similar damage. *Anthonomus pomorum,* L., the small weevil pest of apple buds, is particularly feared in Normandy and Brittany, where it appears in March or April, and oviposits in the flower buds of the apple and hawthorn. The female lays about 30 eggs, boring with her proboscis into the ovary of each bud she visits, but not ovipositing in every case. The egg is laid on the edge of the bore-hole and pushed in with the proboscis. This requires about three-quarters of an hour, and a rather long time is consequently necessary for disposing of all the eggs. These hatch in 6 or 8 days and the larva, which is white and footless, feeds on the stamens, pistil and ovary, and is full grown in 15 to 20 days. The imago emerges in 8 days (about the end of May or the beginning of June), feeds on the parenchyma of the leaves, and hibernates amongst dead leaves, moss, stones, cracks in the bark, etc. Cleaning the tree-trunks and large

branches and setting shelter traps are recommended. The collection of the imagines is useful if carried out in spring before the apple-blossoms appear ; the insects should be shaken down on to a sheet. Damaged brown buds may be collected and placed in a wide-mouthed jar covered with fine wire-gauze which will retain the weevils, but allow the escape of small hymenopterous parasites. *Anthonomus pyri*, Boh., is a nearly allied species, but has a different life-history. The eggs are laid in the young leaf buds in autumn and the larvae are full-grown in May, by which time they have hollowed out the buds. Infested shoots should be collected and burnt before the weevils appear, about mid-April. *Rhynchites coeruleus*, DeG., is a small weevil, the female of which lays an egg in a young shoot and then cuts this until it sinks down by its own weight, being only attached to the branch by a few fibres. A further 2 to 5 eggs are then laid in the hanging fragment. From this habit it has acquired the name "*coupe-bourgeon.*" The larva hatches in 8 days and feeds on the pith of the withering shoot, being full-grown in a month. It pupates in the ground and the imago appears in the following spring. All the pieces which have been detached should be collected and burned, but the gathering of the imagines by shaking the trees is preferable. The same methods are equally applicable to *Rhynchites bacchus*, L., injurious to the pear, apple and apricot, the imago of which sucks the juices of the young shoots. The eggs are laid in May, or more usually in June, singly or in pairs, in the pulp of the fruit. The larva passes its 3 or 4 weeks of life inside the fruit, causing it to fall. Pupation takes place in the ground, the imago appearing either in autumn or spring. Damage by this species is especially to be feared in dry years and Valéry Mayet states that the apple is not cultivated in the Bas-Languedoc outside the irrigated districts, because three-quarters of the fruit is destroyed by this insect. Weevils of the genera *Phyllobius* and *Polydrosus*, appear in spring and attack the young leaves and shoots. Those most to be feared as adults are *Phyllobius oblongus*, L., *P. betulae*, F., and *P. pyri*, L. Their larvae live in the ground and are apparently innocuous. Shaking may be useful, and the application of lead arsenate advisable, though caution must be observed not to injure the young growing tissues. Other CURCULIONIDAE injuring fruit trees pass their first stages in the ground like *Phyllobius*, but are apterous in the adult state and must, therefore, climb the trees in spring in order to feed, the most dangerous species being *Otiorrhynchus raucus*, F., *O. singularis*, L., *O. sulcatus*, F., *O. clavipes*, Bons., *Peritelus sphaeroides*, Germ., and *Cneorrhinus plagiatus*, Schall. These are nocturnal in habit and when present in numbers do serious damage. In 1904 and 1905, nurseries in Vitry-sur-Seine suffered severely from the ravages of *O. clavipes*, which up to then was unknown near Paris. Collection by means of the *Haltica* funnel is recommended and the trees may also be visited by night and the weevils collected with the aid of a lantern. Sticky bands are useful, spread on thick paper tied round the trunk.

GUÉNAUX (G.). **Les Animaux et les Végétaux nuisibles à l'Agriculture.** [Animal and vegetable organisms harmful to agriculture.]—*La Vie Agric. et Rur.*, *Paris*, iii, no. 14, 7th March 1914, pp. 365-372.

A general and popular account of the insects, birds, fungi and

bacteria which are harmful in agriculture, is given, followed by detailed descriptions of the more important species. The following insects are dealt with: *Aulacaspis pentagona* imported into France from Italy; *Icerya purchasi* in the Maritime Alps; *Vanessa cardui* and *Hydroecia xanthenes* on artichokes; the beetroot Aphis; and *Clysia ambiguella* and *Polychrosis botrana* on vines. Insect parasites and insecticides are also discussed.

MARCHAL (P.). **La Désinfection des Plantes par les Fumigations d'Acide Cyanhydrique.** [Disinfecting plants by fumigation with hydrocyanic acid.]—*La Vie Agric. et Rur., Paris*, iii, no. 14, 7th March 1914, pp. 383-386.

This article gives a popular account of the methods employed in using hydrocyanic acid as a fumigating gas to protect shrubs and trees in the field, and stored grain or other vegetable products from the attacks of insects. The account is based on the methods practised on a large scale in America, and details are given of the apparatus used and the methods of its manipulation. (See this *Review*, Ser. A, ii, pp. 103–104).

VUILLET (A.). **La Lutte contre les Ennemis des Plantes par les Insectes auxiliares.** [Combating the enemies of plants by means of useful insects.]—*La Vie Agric. et Rur., Paris*, iii, no. 14, 7th March 1914, pp. 387-389.

A general account is given summarising the results obtained when insects have been employed to control others harmful to cultivated plants; a detailed account is given of *Novius cardinalis* and its use against *Icerya purchasi*, including descriptions of how it may be reared in the laboratory and distributed in the field. (See this *Review*, Series A, ii, p. 397).

PICARD (F.). **Les Insectes Nuisible à la Betterave dans la Midi de la France.** [Insects harmful to the beetroot in the South of France.] —*La Vie Agric. et Rur., Paris*, iii, no. 14, 7th March 1914, pp. 390-391.

Beetroot is cultivated in large quantities in the south of France, both for sugar and for fodder, though to a less extent than in the north. It is subject to the attacks of many insect enemies, some of which have threatened at times to ruin the crops, and these are for the most part different from those found in the north.

The beetroot moth, *Phthorimaea ocellatella*, lays its eggs on the young plants in the spring, the larvae boring galleries into all parts of the plant; the number of generations in a year may be three, four, or even five; the damage continues even after the crop has been gathered. The upper part of the plant should be cut off before the larvae have penetrated into the root, and all attacked plants given to cattle as fodder. Stored roots should be kept in a pit, which may, if necessary, be fumigated with carbon bisulphide, $4\frac{1}{4}$ oz. to the cubic yard. Deep ploughing will bury the pupae that may remain on the ground after the harvest.

The beetroot fly (*Pegomyia hyoscyami*), which is common throughout France, attacks the leaves, living between the two epidermal layers.

The beetroot *Aphis* is also widespread in France and was the cause of considerable damage in Hérault in 1913.

The Halticid beetle, *Chaetocnema tibialis*, lives not only on the cultivated beetroot, but on all plants belonging to the Salsolaceae. It has several generations and the larva bores galleries in the parenchyma of the stem and leaves. There is some fear of its spreading northwards up the Rhone valley.

*Conorrhynchus mendicus* is the most harmful insect attacking beetroot in the south. It is a large weevil, appearing in the spring, and devours the young leaves. The eggs are laid on the ground; the larvae bore into the plants, particularly into the root. There is one generation a year; the period of development varies in length; usually the larva undergoes metamorphosis in the earth or in the tissues of the beetroot; the adult appears in the autumn, but hides in the earth until the following spring; in some cases the life-cycle is more rapid and adults may appear in September, in which case they feed, but do not reproduce until the following spring. Development will continue in roots that have been stored. Attempts to control the larvae have failed; spraying the foliage with arsenicals is said to have good results against the adults, but the author, after having tried this with considerable care for two or three years, does not recommend it. Natural enemies of *C. mendicus* appear to be numerous, especially *Bacillus cleoni*, which resembles *B. coli*, but differs in its power to liquefy gelatin.

The weevil, *Lixus scabricollis*, is for the first time recorded as injurious to beetroots in Montpellier; the larvae live in the main stem, and the adults on the leaves. The damage is at present slight, but in a favourable season might be much more serious, as has been the case with *L. elongatus* var. *rufitarsis* in Tunis.

**Frühlingsarbeiten im Weinberg und Stand der Reben: Rebenschädlinge.** [Spring work in the vineyard and condition of the Vines: Vine pests.]—*Schweiz. Zeits. Obst.- u. Weinbau, Frauenfeld*, xxiii, no. 5, 11th March 1914, pp. 76-77.

The vine-scale was very abundant in Swiss vineyards in the spring of 1914; if lime suspended in soapy water, to form a thick liquid, be painted over the stems of the vines early in the season, the rapid multiplication of the scale is checked.

**Zur Bekämpfung des Heu- und Sauerwurmes.** [To combat the vine moth.]—*Schweiz. Zeits. Obst.- u. Weinbau, Frauenfeld*, xxiii, no. 5, 11th March 1914, pp. 78-79.

A short account of the vine moth and of the methods of controlling it in the valleys of the Rhine and Moselle, is given. Good results were obtained with the mixture made by the firm of Golaz in Küsnacht, and also with nicotin sprays. The cost of either of these is from 50 to 65 shillings per acre. Covering up the grapes with paper bags at the time when egg-laying takes place, was found to give good results; 15,000 bunches were covered in this way, at a cost of about 5*l*. and the damage done by the pest in these circumstances was negligible.

MARIÉ (P.). **Rapport du Directeur du Service de l'Entomologie agricole.** [Report of the Director of the Department of Agricultural Entomology.]—*Supplement au Bull. Soc. Agric., France, Paris*, xlv, no. 1, 15th March 1914, pp. 73-80.

This is the first report of the entomological department since its inauguration as part of the French Society of Agriculturists in 1913. A brief general account is given of the lines upon which work has been carried out, namely instruction as to harmful insects, the damage they do, methods of destroying them, and secondly, experimental and research work. The report gives also the information furnished by the department in answer to inquiries received during the year.

**La lutte contre la mouche de l'olivier en Italie.** [Combating the olive fly in Italy.]—*Bull. bi-mens. Off. Gouv. Gén. Algérie, Paris*, xx, no. 6, 15th March 1914, pp. 98-100.

The first method referred to is that of Professor Lotrionte [see this *Review*, Ser. A, ii, p. 289], with the following additional data. Each trap (capanetta) requires just under $1\frac{1}{2}$ oz. of mixture, the total liquid required per tree being about 8 oz. and costing a fraction over a penny. The total cost is nearly $2\frac{1}{2}$*d.* per tree per annum or 10*l.* per 1,000 trees. An account is also given of experiments by Professor Berlese, which aimed at reducing to a minimum the practice of spraying the trees, using instead traps consisting of wide-mouthed jars containing poisoned bait, or bundles of straw soaked in poisonous liquids. In the traps, arsenite of soda was used with sugary solutions ; experiments tended to show that the sugar in the solution does not play an important part in attracting the flies, soapy solutions containing no sugar proving equally, if not more efficacious in this respect. The poisoned bundles of straw, one below each tree, proved very effective in attracting and poisoning the flies. Berlese concludes that meteorological conditions greatly affect the efficiency of traps. When a hot summer is followed by a cold autumn, the traps are less efficacious than when summer and autumn are both very hot. He recommends in all cases a mixed treatment consisting of spraying in the early part of July followed immediately by the use of traps.

BAUER (—). **Rückblick auf das Jahr 1913—Allgemeine Lage des pfälzischen Weinbaues.** [Survey of the year 1913—General conditions of the Palatinate vineyards.]—*Weinbau der Rheinpfalz, Neustadt a. d. Hdt.*, ii, no. 6, 15th March 1914, pp. 63-66.

A general account is given of the conditions of the Palatinate vineyards in 1913. Contrary to what is usually the case, *Polychrosis botrana* appeared later than *Clysia ambiguella*, which was very abundant towards the end of April. The damage, which was caused chiefly by *C. ambiguella*, was severe, especially in the case of backward vines. The second generation appeared about the middle of July, and weather conditions in August and September favouring the development of the larvae, much damage was done to the ripening fruit. Good results were obtained with the use of tobacco extract and soap solution, but it is thought that if frost had appeared earlier, as it did in 1912, or the weather conditions had been otherwise unfavourable, it would have

been necessary to gather the harvest before it was ripe, as soap solutions cause an appreciable delay in the maturation of the fruit. A third generation of moths appeared in October, hatched from late eggs. It is worthy of note that localities which suffered from sharp frost in the early spring were little damaged.

FULMEK (L.). **Ein neuer Getreideschädling.** [A new pest of grain.] —*Wiener landwirtsch. Ztg.*, *Vienna*, no. 20, 25th March 1914, 5 pp., 1 fig.

An account is given of the damage done to stored grain by the larvae of the moth *Trachea* (*Hadena*) *basilinea*, F.; this species has not been recorded near Vienna as a pest since 1855, when Kollar referred to it under the name *Noctua basilinea* as a pest of stored rye. The larvae hibernate in the ground, on or near the surface; they pupate in the spring and in June the moths appear. The eggs are laid on grasses, which appear to be the normal food-plants, but if the insects are more than usually abundant, they attack wheat, rye or barley; they bore into the ear and eat out the grain while the corn is still standing, and are brought with it into the barns. Whether these larvae hibernate in the stored grain without harming it, and whether the adults arising from them, which emerge in the following spring, lay their eggs on the stored grain, is not known.

Similar damage due to the same species is recorded in France, Silesia, Bohemia and Eastern Europe, and the insect is widespread in Central Europe, but does much less damage there than in Denmark and Sweden. Methods of control are not easy; Reh advocates the protection of moles as the best remedy; Lemcke suggests separating out the attacked corn in the field, thrashing it as soon as possible and collecting the larvae and killing them in boiling water. Deep ploughing to bury the pupae is suggested, but has not been tried.

MILANI (A.). **Ueber Bekämpfungsversuche des Sauerwurmes mittels Schutzhüllen nach D. R. P. 250053.** [Experiments on combating the vine moth with paper bags.]—*Zeitsch. Pflanzenkrankheiten, Stuttgart*, xxiv, no. 3, 28th March 1914, pp. 139-148.

Of the two generations of the vine moth (*Clysia ambiguella*), the second, which attacks the fruit when it is ripening, is more difficult to combat than the first, which attacks the leaves and flowers before the fruit appears. Sprays have been used against the insects with a moderate amount of success, in so far that they destroy them, but methods involving their use have been abandoned by the author, on account of their harmful effects on the plant and fruit, especially when arsenic or nicotin is used. These are the most effective poisons, but the continued use of arsenic results in its absorption by the roots of the plant and may contaminate the fruit, while nicotin is said to affect the taste of the fruit and the wine made from it. The first methods adopted by the author were directed entirely against the second generation of the moth and were purely mechanical, consisting of enclosing the bunches of fruit in paper bags tied round their bases so that there was no inlet for the moths; this was done in June, just before the time of appearance of the second generation. This method was found to be useless, as in most cases the fruit already harboured

the pupae of the second generation which gave rise to adults in the bags and these attacked the fruit in greater numbers than if they had remained uncovered by the bags. Another method which would have obviated this difficulty would have been to enclose the shoot in bags before the flower was fully formed and before the appearance of the first generation ; but this method was not tried as the flower and fruit could not have developed under such conditions. In the next series of experiments, the bags were used as before but instead of being tied on with no outlet, they were fixed on with bird-lime and a small exit was left surrounded by the lime. In the vine moth, the males hatch out before the females, which serves to prevent in-breeding, and the first impulse of the males is to fly away in search of other females ; thus the males hatching in the bags would attempt to escape by the outlet ; many would be caught in the bird-lime, and it is unlikely that the few that succeeded would again escape the bird-lime in trying to effect an entrance into another bag. Thus the females would be for the most part unfertilised and no larvae would develop. This idea was carried out in 1911, partly at Geisenheim and partly in the author's garden at Eltville, near Mainz. At Geisenheim 100 bags were used, being fixed on July 5th and removed on August 16th. At Eltville 60 bags were fixed on July 4th and removed on August 14th and 15th. At Geisenheim the results were not conclusive, as neither protected nor unprotected vines were attacked by the moth, but at Eltville the unprotected vines suffered severely, while the protected fruit showed no signs of being attacked. There was no difference in the vines as regards the attacks of *Oidium*. In the following year (1912) the experiments were continued at Eltville and at Eibingen. At Eibingen 700 bunches were protected from July 9th to September 4th, and at Eltville 57 bunches from July 6th to September 3rd. It was found that the non-protected fruit was severely attacked by the vine moth, and to a less degree by *Oidium* and fungoid diseases ; the protected fruit showed no attack by the moth, rather less fungoid disease and the same amount of attack by *Oidium*. The protected grapes were also better developed than the unprotected. In 1913, experiments were made on the same lines at Kiedrich with similar results ; on the unprotected fruit *Botrytis* appeared in September, but not on the protected fruit. The cost of the process was not determined accurately, but it is estimated that 1,000 bunches of fruit would cost 9 shillings to protect. On account of the high price of wine it is worth carrying out on a small scale, while the margin of time during which the bags may be fixed, is long enough to make the process practicable on a large scale. The process has been patented in Germany (Germ. Imp. Pat. No. 250053.)

VUILLET (A.). **Préparation et Emploi des Bouillies Sulfo-calciques.** [Preparation and use of the lime-sulphur spray.]—*L'Agron. Colon,, Paris,* i, no. 9, 31st March 1914, pp. 74-81.

The author describes the methods of preparation and the use of lime-sulphur spray, the account being based upon the work done in connection with it in England, Italy, and the United States. As a general rule, the best concentration of the spray is that which slightly burns the foliage, but the author emphasises the fact that no definite

rule can be laid down on this matter, as this varies with the climate, the plant and the insect to be destroyed. On an average a 4 per cent. solution will not harm the foliage of non-deciduous trees, even at the period of active growth, while 6–8 per cent. may be used without danger during the resting period ; for deciduous trees 8 per cent. and more may be safely used after the fall of the leaves. The author gives an example of his own experiences with the lime-sulphur spray on tangerine trees at Mentone ; the trees were infested with *Ceroplastes sinensis*, and were treated unsuccessfully in February with a 4 per cent. solution. A month later the same trees were treated with an 8 per cent. spray, and all the insects were destroyed, but the foliage was also damaged. An intermediate strength of 6–7 per cent. would have possibly given equally good results with less damage to the trees.

Sirrine (F. A.) & Fulton (B. B.). **The Cranberry Toad-bug.**—*New York Agric. Expt. Sta., Geneva*, Bull. no. 377, March 1914, pp. 91-112, 4 figs., 8 pls.

The Homopterous insect, *Phylloscelis atra*, belonging to the family Fulgoridae, has not been previously recorded as injurious to cranberries. Earlier accounts show that this insect was described from migrants collected on plants other than cranberry and no economic importance was attached to it. The cranberry growers on Long Island have been troubled by a peculiar withering of the new growth of the vines, which the authors, after inspecting a cranberry bog at Calverton in July 1912, diagnosed as being caused by this insect. It apparently feeds only on the cranberry and is not widely distributed, many bogs being free ; on two Long Island bogs the crop of fruit has been reduced from 50 to 75 per cent. during the past three years. Statistics are given showing the decreasing output, with a marked increase after treatment. A detailed description of the egg, the 5 instars of the nymph and the adult stage is given. The life-history of the insect was followed in the field and in breeding cages until adults were obtained, which were identified by Mr. E. P. Van Duzee. Under natural conditions the insect baffled all attempts to study its habits during the egg-laying period, but by means of breeding cages it was found that the eggs are deposited from September 1st to the middle of October. During this period the females were constantly dropping to the ground and running over it to another branch of the same or another plant, dragging an egg by its stalked end, so that small particles of sand adhered to it, often completely covering it. The egg was usually lost on the ground, and the particles of sand undoubtedly help to prevent the eggs floating when the bogs are flooded as they usually are between mid-November and 1st May. So far as was observed, no eggs hatched until 25th–30th June, nymphs being found on 29th June ; while observations after flooding, detailed below, indicate that a large portion of the eggs hatch after 15th July. When hatched the young nymphs crawl up the vines, insert their beaks into the bark and begin to feed : they are usually found in groups of 2 to 6. After the 3rd or 4th moults the insects are more active and are more frequently found on the new growth of the vines. As the nymphs grow they secrete a pulverulent, cottony substance, so that the body appears to be covered with tufts of white hairs : these break

away as a powdery substance which adheres to the branches or may fall to the ground. The adults vary in size, structure, colour, and habits. The authors' collections and notes show that males with abortive wings and short elytra are the first to reach maturity, at the beginning of August. The early-maturing individuals of both sexes are dark-coloured and, later in the season, males and females of both short and long-winged forms are light-coloured. An occasional male and many females develop wings for migration, and these are the forms generally obtained by collectors on various plants. The majority of the adults have abortive wings and remain on the bogs, and so far as observed, only the dark-coloured winged forms were able to fly. The light-brown females with both pairs of wings well developed, possessed little or no power of flight and the venation on the elytra was indistinct. Early in September some of the females reached maturity; mating was first observed during 1913 on 14th September, and insects in copula were detected as late as 15th October. The injurious effect of this pest is similar to that caused by the squash-bug on pumpkins, though the evergreen leaves of the cranberry do not show the wilting so plainly. The new growth takes on a reddish tinge and finally a brown straw-colour, and where the nymphs are feeding only on the old wood the berries are dwarfed, or deformed. Careful observations failed to reveal this species feeding on other marsh plants, though after flooding a bog they may be collected on weeds and willows at the sides of the marsh. The lady-bird beetle, *Hippodamia* 13-*punctata*, and the soldier-bug, *Coriscus inscriptus*, are abundant in bogs infested with *P. atra*, and are considered probable enemies of it. The spined soldier-bug (*Podisus spinosus*), also occurs, but is less abundant. A number of undetermined ground and jumping spiders are generally common in the bogs and were frequently observed to attack *P. atra*. During 1913, a fungoid disease was conspicuous in the breeding cages, and evidence of this was occasionally found in the field. Experiments as to the best methods of control were tried in the years 1912 and 1913, details of which are given. It being too late for spraying in the season of 1912, when the importance of this pest was realised, flooding was resorted to. This is an unusual practice with cranberry-growers after the fruit has set, because of the danger of "scalding" the berries, though often done before flowering to control such pests as the fruit and vine worms. A cloudy day was chosen, the water being allowed to remain for 48 hours. The bugs would not remain under the water if they could escape, and were driven to the tops of the vines from which they floated as the water rose, climbing the taller weeds and rubbish. A strong wind blew all the bugs to one side of the bog where they climbed all available plants in such numbers as to weigh them down. They were sprayed with pure kerosene as they were driven ashore, also with Vreeland's insecticide soap, using 1 part to 6 parts of water; the bugs being readily killed by both, but the drift and rubbish being better penetrated by the kerosene. Forty-eight hours after the water was drawn off, the bog was examined: most vines were free from insects, but on plants which had been only partly submerged, many were observed, and along the margins of the marsh in certain places were a few specimens, indicating a re-invasion by individuals which had managed to escape the kerosene owing to the protection of weeds

and rubbish. A week later, young nymphs were found where the infection had been and by 19th August they were quite plentiful, being distinguishable from the survivors of the flood by their smaller size and more general distribution. This flooding was apparently done too soon, some of the eggs, which seem to be able to withstand immersion, having been still unhatched. Another bog was flooded in 1912 after the fruit was picked on 2nd October, in order to determine how late such a procedure could be carried out with advantage. The water was left on 48 hours and large numbers of adults came ashore on drifting leaves and rubbish, which was collected and burnt. These bogs being found in July 1913 to be again infested, it was decided to re-flood them. This was more successful, especially when accompanied by a careful preliminary cleaning of the banks and removal of cover for the insects, combined with spraying with kerosene, the burning torch spray being found good on the grasses and weeds, while an oil spray proved a most efficient treatment for floating insects. Various experiments were also made with a variety of insecticides, and charts and some particulars of costs are given.

From these experiments, the authors think that submersion of the bog is to be preferred, if it is possible, though further experiments with contact insecticides are desirable. From the knowledge so far obtained of the life-history and habits of the insect, it is evident that flooding should be carried out in the first half of August, not before, for sections in the same latitude as New York City. It should be remembered that carelessness in flooding during the summer would undoubtedly spread the migrating winged forms faster than any other method; it is doubtful if they are ever spread by transportation of the vines, as the eggs rarely if ever remain on them. On dry bogs, spraying is the only method and the following suggestions are offered. Where the vines are heavy and contain much old wood, mow them off at the usual season for cutting, and then between 1st and 15th August spray thoroughly with two applications of a soap solution.

Eustace (H. J.) & Pettit (R. H.). **Spray and Practice Outline for 1914.**—*Michigan Agric. Expt. Sta., East Lansing,* Special Bull. 69, March 1914, 24 pp., 7 figs.

In this bulletin the authors give careful instructions with regard to sprayings for various crops. Should scale-insects be present on apple trees, spray very thoroughly with a strong lime-sulphur wash just before the buds open, covering every part of the tree. Just before the blossoms open a spraying must be made against canker-worm (*Palaeacrita vernata*), bud-moth (*Tmetocera ocellana*), and other insects. For this and later sprayings use dilute lime-sulphur or Bordeaux mixture. To every 50 gallons add 2 or 3 lb. arsenate of lead (with lime-sulphur this is the only poison that can be used). This must be repeated immediately after the blossoms fall and before the calyx closes, directing the spray downward from above as much as possible, in order that some of the material may reach the calyx-cups, and poison the larvae of the codling-moth when it attempts to enter. It should be again repeated two weeks later. Early in August, there will be a second generation of codling-moths and the date of this emergence should be determined by collecting and keeping in captivity some of

the pupae. Detailed instructions for doing this are given. The time to spray the autumn and winter forms is just before the young hatch and enter the fruits, about a week or ten days later, using the same amount of poison as before, but rather weaker lime-sulphur or Bordeaux mixture. The lesser apple-worm (*Enarmonia prunivora*) works more superficially, and when present, requires a spray of poison when the fruits of standard winter varieties are from 1 to 1½ inches in diameter. Where the Curculio (*Conotrachelus nenuphar*) is present on peaches, spray with poison directly the blossoms drop, using 2 lb. arsenate of lead to every 50 gallons of water. To prevent injury to tender foliage, 3 to 5 lb. of slaked lime should be added to every 50 gallons of spraying material. No arsenic compound except arsenate of lead should be used on peach trees. Two weeks later another spray will be necessary, this time of self-boiled lime-sulphur, adding 2 lb. arsenate of lead to every 50 gallons, repeating this about a month before the fruit ripens. Self-boiled lime-sulphur settles very rapidly and should be well stirred, the arsenate of lead being only added just before spraying; fine nozzles should be used and a uniform coating of a mist-like spray given. The same general treatment for pears as for apples is advised, but in using dilute lime-sulphur, use ¼ gallon less per 50 gallons of the wash.

Plum trees infested with scale-insects should be treated as recommended for apples. Just before the buds open, spray against Curculio with dilute lime-sulphur and Bordeaux mixture and arsenate of lead, 2½–3 lb. to a barrel. Arsenate of lead is preferable to Paris green on all stone fruits, owing to their more tender foliage. Immediately after the blossoms fall it is essential to spray again, using dilute lime-sulphur or Bordeaux-mixture or self-boiled lime-sulphur and 2 lb. arsenate of lead to every 50 gallons. For Japanese varieties, use the self-boiled lime-sulphur or dilute the Bordeaux mixture one-half. The authors mention that their experiments last year showed that dilute lime-sulphur was very satisfactory on plums and it is easier to prepare than the other two sprays. Every 10–14 days the spraying should be repeated, especially if the weather is wet or the Curculio is serious, until there is a danger of staining the fruit, stopping at least a month before picking time.

Cherry-orchards infested with scale-insects, should be treated in the same way as for apples. Just after the blossoms fall, spray with dilute lime-sulphur or Bordeaux mixture with 2 lb. arsenate of lead to every 50 gallons of mixture against Curculio. The authors' recent experiments have shown them that these two sprays are either of them better than the self-boiled lime-sulphur for cherries. Should black lice (*Myzus cerasi*) appear on the leaves, a spraying of tobacco water will destroy them, if applied before the leaves curl too tightly.

On grape vines, dilute lime-sulphur should not be used, as it stunts the growth of the berries, but Bordeaux mixture is efficient. Just before blooming, spray again with Bordeaux mixture to every 50 gallons of which 2 or 3 lb. of arsenate of lead should be added against the grapeberry moth (*Polychrosis viteana*) and rose-chafer, and if the latter is serious, the proportion of arsenate of lead should be increased to 5 lb. and a pint of the cheapest molasses added. This spray should be repeated just as the blossoms are falling. Flea-beetles (*Haltica*) usually appear as the buds open in early

spring, and require a strong poison, 3 or 4 lb. of arsenate of lead to every 50 gallons of Bordeaux mixture, using less poison later. Where the grape-berry moth is serious, spray with Bordeaux and an arsenical poison during the middle of July.

For currants and gooseberries infested with scale-insects, the same treatment as recommended for apples should be used. As the leaves are expanding spray with dilute lime-sulphur or Bordeaux, using 2 lb. arsenate of lead to every 50 gallons. Strawberries suspected of root lice, should be dipped in strong tobacco-water before planting. After growth starts, spray with Bordeaux and a poison to prevent the leaf-roller insect, and if this has been present, spray again after fruiting, but before the leaves curl. If potatoes are infested with bugs, spraying should be done at once, using Bordeaux mixture and about ½ lb. of Paris green or 2 lb. arsenate of lead to 50 gallons of the mixture. This is better for potatoes than dilute lime-sulphur. Cucumber-melon vines have several insect pests. The striped cucumber beetle (*Diabrotica vittata*) feeds on the leaves and its larvae tunnel in the roots; injured plants should be thinned out, and those remaining be dusted with slaked lime 5 or 6 parts and flowers of sulphur one part, or arsenate of lead powder mixed with 9 parts of slaked lime. Tobacco dust should be put on the ground about the bases of the vines. Paris green is not reliable on these vines. The large black squash-bug (*Anasa tristis*) may be trapped under pieces of board.

The preparation of the following spray mixtures is given in detail: Strong lime-sulphur, home-made concentrated lime-sulphur, commercial concentrated lime-sulphur, self-boiled lime-sulphur, Bordeaux mixture, copper sulphate solution, and arsenate of soda from a formula by the late Dr. R. C. Kedzie, which is used by many local grape-growers in combination with Bordeaux mixture, but cannot be used with lime-sulphur sprays. When used alone, as for potato bugs, slaked lime must be added or the foliage will be burned. The formula is 2 lb. white arsenic, 8 lb. washing soda, 2 gallons of water; these materials to be boiled for 15 minutes or until the arsenic dissolves, leaving a muddy sediment; keep in closed vessel; 1 quart is equal to ½ lb. of Paris green, and usually 1 quart in 50 gallons of water with some lime or Bordeaux mixture will be sufficient. Details of contact poisons for sucking insects, and a table of dilutions for concentrated lime-sulphur wash, are also given.

Urich (F. W.). **Insect Pests of 1913.**—*Bull. Dept. Agric. Trinidad and Tobago, Port-of-Spain*, xiii, no. 79, March-April 1914, pp. 101-103.

The cacao trees, the vitality of which had been much reduced by the drought of 1912, were severely attacked by thrips in the northern part of Trinidad, and by cacao beetles, *Stirastoma depressum*, in the south, at the end of 1912 and beginning of 1913. From March onward, the thrips infestation decreased until December, when there was a tendency to increase, coinciding with the ripening of the pods, which bore out the author's observations that thrips breed and increase on nearly matured pods, subsequently migrating to young leaves. Successful results were obtained by forking, liming and draining the

fields, and in December, spraying with Bordeaux mixture to which was added 1 per cent. of Lysol. In the north, successful spraying experments against cacao beetles were carried out with arsenate of lead, and systematic cutting out of larvae and trapping of beetles yielded good results. The best formula for general use was found to be 4 lb. arsenate of lead (paste) and 4 lb. temper lime to 50 gallons of water. When Bordeaux mixture is used, 4 lb. of arsenate of lead should be added to every 50 gallons of the mixture. Twig-girdlers occurred in fair numbers in November and December, and care should be taken to collect and burn all twigs in which they exist. On the sugar-canes, the froghoppers have not been so numerous as in 1912, owing to the unusually damp season. The froghopper egg-parasite, *Oligosita giraulti*, was numerous in November and December, especially in grass fields, and was colonised in a field of 22 acres in July. The Syrphid, *Salpingogaster nigra*, was less numerous than in 1912, seeming to thrive best in damp weather. Mexican bugs are still being reared in the laboratory and liberated on sugar estates in the adult stage; so far they have not been established permanently. No serious outbreak of small moth-borers (*Diatrea*), striped loopers, or caterpillars was observed during the year, no doubt owing to the efficiency of parasites. The giant moth borer, *Castnia licus*, still continues to occur in some localities, but on estates on which the moths are caught regularly this pest seems to be diminishing.

No serious outbreak of any coconut pest was reported during the year, though sporadic cases of severe infestation by the coconut scale, *Aspidiotus destructor*, occurred, but were controlled by spraying with lime-sulphur wash. It was found that destroying the Balata ants and their nests on the coconut trees assisted considerably the control of the scale-insects by their natural enemies.

SASSCER (E. R.). **Notes on Entomological Inspection in the District of Columbia.**—*Jl. Econ. Entom., Concord*, vii, no. 2, April 1914, pp. 240-244.

There are two classes of inspection in the District of Columbia, commercial and departmental. The former consists in the inspection of all imports for florists, department stores and private individuals, and includes such plants as boxwood, azaleas, rhododendrons, roses, orchids, etc. Departmental inspection includes the examination of all plants and plant products introduced and distributed by the office of the Foreign Seed and Plant Introduction, as well as other offices of the Bureau of Plant Industry. Examples are given of the finding of pests in shipments of produce which, but for inspection, might have become acclimatised pests. One consignment of mango plants from Java was found to contain the following scale-insects: *Leucaspis indica*, Marl., *Fiorinia theae*, *Pseudaonidia clavigera*, *P. trilobitiformis*, *Chrysomphalus* (*Aspidiotus*) *dictyospermi*, *Aspidiotus palmae*, *A. lataniae*, *A. hederae*, *Parlatoria pseudaspidiotus*, Lind., *Vinsonia stellifera*, *Lecanium* sp., *Pseudococcus* sp., *Ceroplastes* sp., and in addition several gall insects. Potatoes from Peru, Bolivia, and Ancud or San Carlos and Castro Islands, Chile, were infested with the potato weevil, *Rhigopsidius tucumanus*; potatoes from Peru were also infested with two new species of weevil. Red mangroves, *Heriteria littoralis*, were found to contain a number of Cryptorhynchid

beetles, of undescribed species. Mangoes from Mauritius, India and Ceylon were infested with the mango-weevil(*Cryptorrhynchus mangiferae*); seeds of mango have also been received containing a species of *Rhizoglyphus*, which appears to be a dangerous pest. *Pistacia vera*, from Italy, was slightly infested with *Diaspis gennadii*. Sugar-canes received from the Philippine Islands were infested with a species of *Odonaspis*, and they also appeared to have been attacked by *Xyleborus* sp.; sugar-canes from Hawaii were found to harbour eggs of the destructive leaf-hopper, *Perkinsiella saccharicida*. Date palms, from Egypt, were found to be attacked by *Phoenicococcus marlatti* and *Parlatoria blanchardi*. The avocado weevil (*Heilipus lauri*) was present in avocado seeds received from Mexico and Costa Rica. Seeds of wild cotton from the Northern Transvaal were found to be infested with a species of Bruchid, as yet unidentified.

D'HERELLE (F.). **Le Coccobacille des Sauterelles.** [The *Coccobacillus* of Grasshoppers.]—*Ann. Inst. Pasteur, Paris*, xxviii, nos. 3 and 4, March and April 1914, pp. 280-328 and 387-407, 4 figs., 1 map.

In 1911, the author described a disease in grasshoppers caused by bacteria in Mexico, and at the request of the Argentine Government took up the question again in connection with *Schistocerca americana* and allied species which infest a large area and do much damage. The present paper describes the methods adopted for the propagation of the bacteria in the laboratory, the means of dissemination in the field, and the results obtained.

The bacterium, a *Coccobacillus*, was discovered in grasshoppers in Yucatan and cultivated in peptonised gelatinous media; insects inoculated artificially and those which took the disease in the open from other insects exhibited the same symptoms, death occurring within 24 hours or a little more, and the body exhibiting characteristic putrefaction. The virulence of the bacillus is increased by its passage through the insect, and the diluted intestinal contents of a diseased insect, injected into another, will kill it in an even shorter time. It is of great importance to have the bacteria at their maximum virulence or the insects may recover. The author in the course of his experiments caused the bacteria to pass through the bodies of twelve grasshoppers in rapid succession, in each case diluting the extract of the intestine and using it to inoculate the next insect; by doing this, it was possible to cause death within two or three hours after injection; in different species the number of passages through the body of different insects varies before equal degrees of virulence are obtained. When this stage is reached the bacillus is cultivated in artificial media, and in these the bacteria are disseminated in infested areas; details of the preparation of the media, and the methods of dissemination are given. The cultures are made at the temperature of the air, and are to be used about 10–18 hours after the introduction of the bacillus. They are sprayed over the infested area, 1 litre of the liquid being sufficient for more than 2 acres; the insects which eat contaminated leaves contract the disease and die within a short period, their putrefying bodies infecting other leaves. In the case of *Schistocerca*, there exists another method of contagion, as the insects of this genus devour each other. A swarm of *Schistocerca* was destroyed in eight days from the dissemination of the bacteria.

Other insects which become infected with the same disease are :—Acridians—*Schistocerca peregrina* (Europe), *Caloptenus* sp. (Argentine), *Stauronotus maroccanus* (Algiers) ; Ants—*Solenopsis gemminata* (Argentine), *Atta sexdens* ; and caterpillars which ravaged cotton plantations at Chaco. On the other hand, fowls which ate diseased insects did not suffer ; rabbits and guinea-pigs are also immune and apparently men are not liable to be attacked ; rats, however, died when inoculated.

SERGENT (E.) & LHÉRITIER (A). **Essai de Destruction des Sauterelles en Algérie par le *Coccobacillus acridiorum* de d'Herelle.** [An attempt to destroy grasshoppers in Algeria by means of *Coccobacillus acridiorum* of d'Herelle.]—*Ann. Inst. Pasteur, Paris,* xxviii, no. 4, April 1914, pp. 408-419, 2 figs.

An account is given of an attempt to stamp out the locust, *Stauronotus maroccanus,* in Algeria by means of the bacterial disease caused by *Coccobacillus acridiorum,* discovered by d'Herelle in 1910. In applying d'Herelle's methods to the work in Algeria [see this *Review,* Ser. A, ii, p. 238; and above], three questions arise; these are, whether the coccobacillus which attacks *Schistocerca* is capable of attacking *Stauronotus* with sufficient virulence to cause its death ; whether climatic and other conditions prevailing in Algeria allow of the cultures of the bacteria being disseminated in the open in places infested with grasshoppers ; and thirdly, whether the putrefying bodies of *Stauronotus* are capable of transferring the virus to other insects. It was found that it is possible to cause death to *Stauronotus* within four hours after inoculation with cultures of *Coccobacillus acridiorum,* and that spraying cultures of the bacillus in places where *Stauronotus* occurred, resulted in the death of the insects within a few days, but that further propagation of the disease through the dead bodies of attacked individuals only occurred to a very small extent.

**Cartine di Fenolftaleina.** [Phenolphthaleïn test papers for Bordeaux mixture.]—*L'Agricoltura metaurense, Fano,* x, no. 4, April 1914.

The Cattedra ambulante di Fano draws the attention of agriculturists to the importance of the proper preparation of Bordeaux mixture and the use of phenolphthaleïn test paper as a means of determining the critical point when the lime and copper are in proper proportion. Prepared test papers may be obtained gratis from the Station. So long as these papers are wetted with acid solution they remain white, but in alkaline solution they became intensely red. The following procedure is advised :—A sulphate of copper solution is first made and the milk of lime gradually poured into it, stirring the while, and testing from time to time with the paper. The moment the paper shews any sign of redness, the addition of lime must be stopped.

BUES (C.). **La Coca: anuntes sobro la planta, su cultivo, beneficio, enfermedades y aplicación.** [Coca : notes on the plant, its cultivation and profit, diseases and uses.]—*Boletín del Ministerio de Fomento, Caracas,* ix, no. 7, 1914, pp. 521-543.

In this paper, which is chiefly concerned with the cultivation, etc., of coca on a commercial scale, the author says that the plant

has but few insect enemies and it is necessary for them to appear in very large numbers to produce any effect upon the crop. The most formidable are the ants which cut the leaves into small pieces and carry them off to form their nests. Bisulphide of carbon is recommended as a remedy, the use of poison sprays on the trees being excluded on account of the use to which the leaves are put. A large Bombycid moth has been occasionally observed in the plantations, but it is not known whether the larvae do any damage.

Borodin (Dm.). **Борьба съ вредителями и болѣзнями садовъ въ Маѣ.** [The fight against insect pests and diseases of orchards in May.]—**«Хуторянинъ.»** [*Chutorianin*], *Poltava*, no. 19, 21st May 1914, pp. 554-558, 3 figs.

The author deals with various insects, describes the stage in which they are found in May, and gives the usual remedies against them. The following insects are mentioned in the article. The imagines of *Melolontha melolontha*, against which he recommends shaking, spraying with Schweinfurt green and the protection of starlings; the larvae of *Anthonomus pomorum*, *Aporia crataegi* (which pupate in May), *Euproctis chrysorrhoea*, *Lymantria dispar*, *Malacosoma neustria*, *Cydia pomonella*, *Hyponomeuta malinellus*, and *H. variabilis*; Aphids, *Psylla mali*, and *P. pyri*.

Guppy (P. L.). **Report of Entomologist in charge of Froghopper Investigation in Trinidad for the month of April 1914.**—*Enclosure in despatch to Colonial Office*, 25th May 1914.

This report is largely occupied with the technical difficulties of breeding Syrphid parasites of froghoppers in specially constructed cages. These difficulties are of two kinds, viz :—the failure of the supply of the froghopper nymphs for the food of the Syrphids and the destruction of the flies in the cages by a number of spiders, which it was found to be almost impossible to control.

The author has now discovered that the female Syrphids will live for more than three weeks in a lamp chimney (9 inches by 4 inches) if properly treated. Instead of using the large cage originally constructed, a similar one has been arranged to contain a number of these chimneys. Each fertilised female is removed to glass chimneys with a supply of froghopper nymphs, and every other day the froth containing Syrphid eggs is removed and placed in some suitable locality. In this way it is hoped to be able to regulate supplies of Syrphids according to supplies of froghopper nymphs obtainable.

The scheme of distributing eggs or recently hatched larvae could be carried out, and seems to be more likely to be successful in establishing the Syrphid in suitable places than one which aims at liberating adults for the same purpose.

The author describes his attempts to find Syrphids in their usual haunts and his failure in consequence of the weather being too hot and dry. He thinks that small scattered broods of adults remain in a sort of dormant condition in very dry weather, probably in shady moist situations on the borders of woods. Observations on this point are in progress.

The author had hoped to be able to breed froghoppers during the dry season, on a suitable scale as food for Syrphids, in a specially constructed cage in which sugar-cane was planted, but this has not been realised. The cane showed no signs of froghopper attack and apparently, in spite of artificial watering, the froghopper eggs do not hatch. The following conditions, the author says, are unfavourable to incubation : low temperature at nights, dry atmosphere, and lack of heated moisture in the soil.

The attention of planters is drawn to the following instructions. After the first appearance of early broods of froghopper nymphs they should be destroyed by hand-picking ; the early adult broods should be destroyed with kerosene-lysol emulsion or by squeezing the leaf-sheaths.

Balabanova (A.). **Возможна-ли успѣшная борьба съ яблоновымъ цвѣтоѣдомъ?** [Is a successful fight against *Anthonomus pomorum* possible ?]—**« Прогрессивное Садоводство и Огородничество.»** [*Progressive Agriculture and Market-gardening,*] *St. Petersburg*, no. 21, 7th June 1914, pp. 661-669.

The author describes the damage done by the larvae of *A. pomorum* to the buds of apple trees and proceeds to consider the remedies usually recommended. He thinks that sticky bands cannot prevent the females from reaching the fruit buds and ovipositing on them, although this remedy decreases to some extent the damage done by the pests, especially when the belts are inspected daily and the females beneath them destroyed. Spraying with barium chloride as recommended by Mokrzecki cannot, in the opinion of the author, protect every bud from the weevils, and it is not clear to him what the effect of this remedy is : whether it prevents oviposition mechanically or poisons the females or larvae. The collection of the damaged buds in May, recommended by Mokrzecki, is expensive and also seems to be too long delayed, as most of the larvae have at this time already completed their development and become perfect insects.

Ferris (E. B.). **Truck crops for South Mississippi.**—*Miss. Agric. Expt. Sta.*, Bull. 163, 1913, 24 pp. [Received 5th May 1914.]

The author says that in the State of Mississippi insect and fungus-pests are present everywhere and greatly favoured by the climate. The San José scale is generally distributed and control measures are only partially successful, annual spraying being necessary in orchards. Curculionids are very destructive and, unless energetic measures be taken, may be expected to ruin entire orchards. The cultivation of fruit has hitherto been discouraging, and apples became infested with San José scale from an orchard two miles away. Spraying was carried on vigorously in dry weather, but constantly recurring rains washed off the mixture and the trees were killed outright by scale, nematodes and borers. A commercial orchard of 500 plum trees had to be destroyed owing to the attacks of Curculio (*Conotrachelus nenuphar*). Pears seem to have fewer enemies than peaches and plums. Individual fig trees do well when the soil is packed hard, but under orchard conditions, when the soil is kept clean and loose, the roots are

attacked by insects and fungi. Mulberries and strawberries do well and are remarkably free from insect pests. Spring cabbage is seriously attacked by cabbage worms, and dusting with Paris green (1 part to 16 parts of flour) while the dew is on them is suggested as a remedy. When the crop begins to head, 1 part of powdered white hellebore and 2 parts of flour is recommended. The harlequin cabbage bug (*Murgantia histrionica*) often does great damage in spring, and handpicking, though it is the best remedy, is too costly. Cucumbers and melons are frequently so bored by insect larvae as to be unfit for use.

VASSILIEV (E. M.). **Отчетъ о дѣятельности Опытной Энтомологической Станціи Всероссійскаго Общества Сахаразаводчиковъ за 1913 годъ.** [Report on the work of the Experimental Entomological Station of the All-Russian Society of Sugar-Refiners in 1913.] *Kiev*, 1914, 64 pp., 7 figs.

The following insects are dealt with, beginning with the pests of sugar-beets :—*Bothynoderes punctiventris*, Germ., appeared very early, but in small numbers, and has not done much harm. The report deals with the question of trap trenches round the small fields of peasant proprietors, which occupy a not unimportant part of the field, and leave less space for cultivation. Smaller trenches with more bait-wells are suggested. *Otiorrhynchus ligustici*, L., is injurious both as imago and larva, the former damaging the above-ground parts, the larvae those below the surface. The chief food-plants of these insects include nettles, hops, knotgrass (*Polygonum*), beet, asparagus, *Xanthium*, lucerne, clover, sainfoin, *Melilotus officinalis*, beans, peaches (damaged by the imago), and vines. The weevils cannot fly and multiply either parthenogenetically or sexually. The hibernating larvae were found in November and December, 1913, underneath roots of red clover in the government of Tchernigov. The beetles appear after the 13th May and in European Russia are found from Finland to Bessarabia, the Crimea and Caucasia. The chief remedy consists in trap trenches. *Psalidium maxillosum*, F., was discovered in 1912 for the first time in the government of Kiev, where, as is also the case in Podolia and Poltava, it is found in May and June. It also occurs in Hungary, Rumania and Bulgaria, where it attacks vines. Some investigatons conducted at the Station are described, and it is thought that the larvae feed on the roots of beets ; the weevils appear in the autumn and then hibernate, only one generation per annum being produced.

*Chromoderus declivis*, Oliv., is seldom found in the government of Kiev and then only in small numbers ; last year a specimen was found on 19th April. It also occurs in Hungary and Siberia ; its life-history is not known. Other weevils mentioned are *Chromoderus fasciatus*, Müll., found in Russia, and considered to be a pest of beets ; *Conorrhynchus mendicus*, Gyll. ; *C. luigionii*, Solari ; *C. nigrivittis*, Pall., var. *kindermanni*, Faust, found by the author in the government of Charkov ; *Coniocleonus nigrosuturatus*, Goeze, in Bessarabia ; *Lixus ascanii*, L. ; *Lixus junci*, Boh., and *Tanymecus palliatus*, F., found on beet in April.

Larvae, probably of *Melolontha melolontha*, L., have been found in May on beetroots. *M. hippocastani*, F., were found feeding and in

copula on oaks on 29th April. The eggs of this species are smaller than those of *M. melolontha*. *Blitopertha lineolata*, Fisch., was erroneously identified by the author last year as *Anisoplia deserticola*, Fisch. (see this *Review*, Ser. A, i, p. 486), and is a new pest of beet. It occurs in South and East Europe, Greece, Turkey and Caucasia. *Cassida nebulosa*, L., was found on the 30th April in copula in beet plantations, and some eggs on *Atriplex*, considerable damage to the beet being noticed a fortnight later. *Cassida nobilis*, L., was found in small numbers. Large numbers of adult larvae of *Agriotes lineatus*, L., were found in some plantations, the imagines, however, being only found in meadows. In the laboratory, the beetles during the day remained inside the holes made by them, especially in hot weather. The first eggs were laid on 3rd June, and were deposited at a depth of 1 cm. in the soil; oviposition lasted till 3rd July, and the eggs were glued together in masses of from two to twelve. The larvae appeared after 30th July, and fed till September on rotten dung. *Athous subfuscus*, Müll., were found in May in fairly large numbers in woods. In the laboratory they lived from 26th June to 6th July and oviposited, the eggs being similar to those of *A. lineatus*. The larvae, which are described, emerged after 21st July and fed on rotten dung. *Melanotus rufipes*, Herbst, was frequently found at the end of spring and at the beginning of summer in woods, fields and gardens. One female in captivity deposited 143 eggs between 4th July and 2nd August; the eggs are twice as long as those of the two above-mentioned species of ELATERIDAE. The first larvae appeared after 7th August. *Prosternon holosericeum*, Ol., is found mostly in woods, seldom in fields. The first larva in the laboratory was obtained on 2nd July; it fed on rotten dung. This beetle eats the petals of *Cytisus*, on which plant it is mostly found. Regarding these four species of ELATERIDAE, it is thought that the imagines feed chiefly on the nectar of flowers; *A. lineatus* and *Melanotus rufipes* occurring in meadows and the other two species in woods. *Broscus cephalotes*, L. (CARABIDAE) was found in trap trenches on 12th April; it does good work in destroying ELATERIDAE, but also preys on useful insects, such as *Carabus*.

*Marasmarcha phaeodactyla*, Hb. (PTEROPHORIDAE) are on the wing near Smiela from the end of July till the middle of October; they feed on leaves of beetroots, but no serious outbreak of these pests has occurred since the establishment of the Station. *Laphygma* (*Caradrina*) *exigua*, Hb., and *Phlyctaenodes nudalis*, Hb., are both recorded as pests of beet in Turkestan. The moths of the first generation of *Phlyctaenodes sticticalis*, L., were on the wing from the 21st May to the first half of June; oviposition started on 28th May, the egg-stage lasting from 5 to 8 days; imagines of the second generation appeared after 12th July, and oviposited in the second half of July and the beginning of August, the egg-stage lasting 5 days and the moths of the third generation appearing on 28th August. Women occupied in collection of these caterpillars in the government of Charkov suffered from swollen hands and noses and some of them from vomiting, which is ascribed to the action of the liquid ejected by these caterpillars; wooden graters, invented by F. F. Helzerman, for the crushing of the caterpillars are figured and described. An egg-mass containing 17 eggs, being the maximum number

noticed in one mass, is figured. About 21 per cent. of the eggs were infested by parasites, the parasites of the second generation attacking also the hosts of the first one. The author corrects a former statement of his, that sorghum is not attacked by these caterpillars, as it is now found to be one of their food-plants.

*Pegomyia hyoscyami*, Panz. (*Anthomyia conformis*, Fall.) Injury to the leaves of beet by the larvae of these flies was noticed in May. On the lower side of the leaves at the entrance of the mines the empty shells of the eggs may be found; the number of eggs in a mass is from 2 to 12, usually 4 or 5; they are arranged either in two lines or irregularly. The eggs were also noticed on leaves of *Hyoscyamus niger*. Oviposition of the first generation extended over two months, the first flies of the next generation appearing on 26th July. The eggs hatch in 2 to 3 days and when emerging from the egg, the larva drills a hole in the shell, sufficient for its mouth-parts to protrude and seize the parenchyma of the leaf; it then proceeds to mine into the leaf. The larvae pass through three stages, moulting twice. About 60 per cent. of these insects were attacked by parasites, sometimes in the larval stage. Spraying with barium chloride was tried; a 7 per cent. solution gave good results, a 6 per cent. solution killed 54 per cent. of the larvae and a 5 per cent one destroyed 25 per cent.

With regard to APHIDIDAE, the author refers to the "Food-plant Catalogue of the APHIDIDAE of the World," Part III, by Miss Edith M. Patch, and quotes the list of 13 species of Aphids injuring beetroot there recorded, to which he adds *Macrosiphum circumflexum*, Buckton, and makes some notes with regard to the nomenclature. *Aphis cucumeris*, Forbes, is stated to be synonymous with *Aphis gossypii*, Glover; *Aphis papaveris* and *A. rumicis*, with *A. euonymi papaveris*, or *A. euonymi*; *Siphonophora pisi*, Williams, known in America as *Nectarophora pisi*, Kalt., is synonymous with *Macrosiphum pisi*, Kalt.

*Poeciloscytus cognatus*, Fieb. (CAPSIDAE) attacks plants of many orders. Destruction of weeds and catching by means of movable shields moistened with kerosene are recommended as remedies. *Campylomma verbasci* injures beetroot and apple-trees by sucking the growing tips and leaves of young seedlings. This pest is found in South Russia, Western Europe, Caucasia, Turkestan, Algeria and North America.

The Tyroglyphid mite, *Rhizoglyphus echinopus*, Fum. & Rob., has been noticed yearly on beetroot since 1909, and also attacks plants of many other orders.

The second part of the report deals with insect pests of plants other than beetroot.

*Byctiscus betulae*, L., injures vines and must be distinguished from *Rhynchites betulae*, L. *Crioceris* 12-*punctata*, L., *C.* 14-*punctata*, Scop., and *C.* 5-*punctata*, Scop., were found on asparagus up to the 22nd of September; usually they appear about 18th May, the first generation damaging the foliage and the second the fruits; spraying with Djipsin is suggested. *Dermestes frischi*, Kugel, was imported in 1913 from Tiflis in collections of fungi, but has been previously recorded near Kiev. *Entomoscelis adonidis*, Pall., and *E. sacra*, L., were found in small numbers; it is probable that the adult beetles of the latter winter in the earth. *Harpalus tardus*, Panz., was found last year on

21st March ; it injures *Camelina sativa* (Siberian oil seed), but its life-history has not been studied. *Haltica ampelophaga*, Guér., was found on winter-sown wheat. *Polyphylla fullo*, L., was on the wing in large numbers at the Station on 14th July ; they can be caught on fermenting molasses. *Epicometis* (*Tropinota*) *hirta*, Poda, was found on 9th April on wheat. The small Longicorn beetle, *Tetrops praeusta*, L., was found on 27th May on a pear tree.

The larvae of *Aporia crataegi*, L., fed in captivity on buds of pear and plum trees, but did not touch those of roses and *Euonymus* ; on the 1st May, parasites hatched from some of the caterpillars, and it is thought that they were infested before they were brought to the laboratory ; most of the caterpillars pupated on 14th May ; other parasites hatched from the pupae on the 17th and 18th May, and the butterflies emerged between the 27th May and the 13th June. *Euproctis chrysorrhoea*, L., was found in very small numbers. Two pupae of *Plusia confusa*, Steph. (*gutta*, Gn.) were found on asparagus.

In a concluding article the author deals with the geographical distribution of species of *Lixus*, injurious to beet, in Western Europe and European Russia.

*Lixus ascanii*, L., is known in Russia in the governments of Poland, Bessarabia, Kiev, Cherson, Charkov, Taurida, Kursk, Voronezh, Saratov, and in the province of the Don. Of the varieties of this insect, var. *circumdatus*, Schh., is unknown in Russia ; var. *sicanus*, Cap., is found in Caucasia ; var. *albomarginatus*, Boh., is reported by Sacharov from Astrachan, and also occurs in Turkestan ; var. *wagneri*, Lucas, in Caucasia. *L. lauferi*, Petri (*lateralis*, Bris.) is recorded only from Hungary. *Lixus junci*, Boh., has been reported from the government of Warsaw by Osterloff, but the author doubts the correctness of this statement. *Lixus scabricollis*, Boh., is not found in Russia. *Lixus cardui*, Oliv., is known in the governments of Kiev, Bessarabia, Cherson, Charkov ; var. *cynarophilus*, Cap., in Voronezh, Kazan and Caucasia.

Plotnikov (V.). **Вопросы и отвѣты.** [Queries and answers.]—**« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent*, no. 1, 1914, p. 75.

In reply to a query by a subscriber, the author describes remedies against scale-insects, recommending spraying with emulsions containing kerosene, such as soap-kerosene, milk-kerosene and lime-kerosene. He specially recommends the latter and gives a recipe for its preparation, viz. : 2 oz. of caustic lime slaked in 8 oz. of tepid water, after which more water and 3 lb. of kerosene are added. This emulsion is dissolved in about $2\frac{3}{4}$ gallons of water and must be shaken before use. The total destruction of scale-insects requires two or even three applications, which do not burn the leaves, though in the case of plants with tender foliage the strength must be previously tested by experimental sprayings.

Hudson (H. E.). **The Chinch-Bug in Ontario.**—*Entom. Circ. Dominion Dept. Agric., Ottawa*, no. 3, Feb. 1914, 13 pp., 3 figs. [Received 19th May 1914.]

The author here deals further with the chinch-bug, *Blissus leucoptera* [see this *Review*, Ser. A, 1, p. 401.] At the time of his arrival

at Thorndale, May 26th, the bugs had been pairing for a few days. Several copulating pairs were put on oats growing under glass chimneys; the first eggs were deposited May 28th and hatched June 18th; the average egg-production per female was 95; the period of oviposition was 18 or 19 days, but under field conditions this period for the whole brood occupied 6 weeks. The females apparently required repeated fertilisation, individual pairs having been observed to be copulating on four occasions. On cold days the bugs concentrate at the base of the plants, but when the sun shines they move in all directions over the field, especially seeking the higher or drier parts: hence a poor-conditioned field is more liable to serious injury than one where the crop is in good heart and forms a dense shade, and should the grass remain succulent throughout the summer, the bugs are not likely to migrate in search of food. The infected area covers about 5 square miles in Middlesex County, the greatest injury being in the centre. Grass-farms are most injured, but where a regular system of rotation is followed and the land is ploughed every 3 or 4 years, chinch-bugs are scarce, except in woodland pasture left unploughed. Open winters and wet summers are unfavourable to this pest, but a succession of dry summers, especially during the breeding and hatching season, would be likely to induce an outbreak. Wet weather favours *Sporotrichum globuliferum*, which destroys about 25 per cent. of the insects. A new remedy suggested is a dusty furrow, for dry hot weather. A strip of land 6–8 feet long should be deeply ploughed next to the infested field, the ground being thoroughly pulverised. A weighted log 6 to 8 feet long, sharpened at one end, should be drawn lengthwise, backwards and forwards until a deep furrow has been made across the line of the chinch-bugs' path. The dusty sides will prove impassable to them and the heat of the sun will kill the majority. If there is rain, holes about 12 inches square, and the same depth should be dug in the bottom of the furrow, and asphalt road oil, No. 7, should be poured along it. The quail appears to be the only bird which feeds upon this bug to any extent.

SOPOTZKO (A.). **Опытъ борьбы съ озимымъ червемъ при помощи ловли бабочекъ на патоку въ крестьянскихъ хозяйствахъ Богородицкаго уѣзда.** [An experiment in fighting the larva of *Euxoa segetum* by catching the moths on molasses in the peasant holdings of the district of Bogoroditzk (Govt. of Tula).]—*Published by the Entomological Station of the Zemstvo of the Govt. of Tula. Tula,* 1914, 15 pp., 1 fig.

The author refers to the good results obtained by the use of this method on some large private estates in South Russia, where it had been recommended by the Entomological Station of Kiev, and to the difficulty of inducing the peasant population to apply such other remedies as rotation of crops, the early ploughing of fallow fields, occupied fallow land (see this *Review*, Ser. A, ii, p. 340) and the suppression of weeds. The Station of Tula, therefore, decided to make an experiment in 1913 with this remedy. According to the time of the appearance of the first generation of *E. segetum* in the government of Tula, the troughs had to be put out about the 2nd June and not removed from the fields before the 14th July. The troughs were placed

at a height of 3 or 4 feet, the number varying from 1 on every 54 acres to 3 on 27 acres, according to the amount of damage done by the larvae to the winter-crops of the previous year. In South Russia the troughs are usually put on fallow-fields, but the Station decided to put them on winter-sown fields, which were injured last year and where the moths might be expected.

The total number of insects caught in 21 troughs was 860,843, of which 86·36 per cent. were *Euxoa segetum*, and 3·72 per cent. *Feltia exclamationis*. It is estimated that this number of insects could have produced 77½ millions of larvae. The total cost of the experiment, for which 58 cwt. of molasses were used, including wages, etc., was £66 8*s*. 0*d*., 36 lb. of molasses being sufficient for one trough for the whole period. The experiment is considered to have successfully convinced the population of the utility of this remedy. An index of 81 species of insects, caught on molasses, in the government of Tula, during 1910-1913 is appended.

Rimsky-Korsakov (M. N.). **Изозомы, вредящія хлѣбнымъ злакамъ въ Россіи.** [Chalcids of the genus *Isosoma* injurious to grain crops in Russia.]—**«Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture*], *St. Petersburg*, 1914, x, no. 11, 84 pp., 50 figs., 3 pls.

This work is the result of investigations on *Isosoma* conducted by the author in 1897–1898 in the government of Cherson, he having been specially sent for this purpose by the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture. The delay in the publication of the report has been chiefly owing to the difficulty of the identification of the parasites of these insects. The author points out that the biology of *Isosoma* in Europe is as yet practically unknown.

The genera *Isosoma*, *Philachyra* and some others, differ from the remaining genera of Eurytomidae which are parasitic on insects and other Arthropods, in that they are phytophagous and frequently cause serious damage to plants. The author gives a general description of the imago, eggs, larvae and pupae of these insects and refers to the history of their discovery. Some other representatives of the Chalcidoidea (Agaonidae, Torymidae) also breed on plants. Five species of *Isosoma* were found by the author in the government of Cherson.

*Isosoma rossicum*, sp. n.; having described the males and female of this species and pointed out the difference between *I. rossicum* and *I. hordei*, Harris, for which this species was mistaken by Portchinsky and Lindeman, the author proceeds to describe the development and life-history of these insects. The adults are on the wing near grain fields during the first half of June; in captivity the author has reared adults in February and March. Both sexes eat the pollen and drink the nectar of flowers. Adults seem to live only about a fortnight. The eggs are deposited inside the stems of rye and wheat, chiefly in the internodes or on the nodes themselves. The maximum number of eggs laid on one internode is 12, as shown by the number

of galls, which appear later on the spot attacked, though whether these are laid by one or more females is unknown. The egg, which is described and figured, produces a larva in 10 to 14 days; the young larvae are found as early as the middle of June, and adult larvae in the first half of July. Only two moults were observed, but it is thought that there are more. Like the larvae of *I. inquilinum*, those of *I. rossicum* change their appearance during growth, the later stages losing the cone-like appendix which covers the head of the newly-hatched larva. The larvae remain in this stage for about two or three days without feeding, and after moulting, the appendix on the head is replaced by a small blunt projection. The larva moults again in five or six days and attains its final form. The galls caused by oviposition, which are of a green or yellow colour, are usually situated behind the leaf-sheath, so that it is necessary to turn back the latter to discover them, though where there is a large number of galls the nodes are visibly swollen. The author has found such galls mostly on rye and very seldom on wheat; on the latter plant the single galls usually overlap each other, forming a common gall in which the several larvae are situated in separate chambers, the leaf-sheath being involved in the galls. In the first half of July, when the larvae are adult, they cease feeding and remain dormant until they pupate in the middle of the following May, the pupal stage lasting from two to three weeks. The life-history and the character of the galls of *I. rossicum* are similar to those of *I. hordei*, Harris, and *I. tritici*, Fitch, which attack barley and wheat.

*Isosoma noxiale*, Portch., described and figured by the author, appears in its adult stage in the middle of May. The eggs are deposited on summer-sown, as well as on winter-sown wheat and are laid in the third and fourth internodes, one egg being deposited in each. The larvae live inside the stalks of the wheat, feeding on their walls, principally in the lower third of the internode. The young larvae appear from the middle of June onwards, and having become adult, pass into the node and build there a cylindrical cell in which they remain, head downwards, for about 9 or 10 months, pupation taking place in May and lasting about a fortnight.

*Isosoma inquilinum*, sp. n., in its adult stage is very similar to *I. noxiale*; it appears in the fields simultaneously with *I. rossicum*, and oviposits on the same plants, so that usually, on opening the galls of the latter, larvae of *I. rossicum*, in their first stage, and from one to four eggs of *I. inquilinum*, are found together. The eggs of *I. inquilinum* are of a clear grey colour, while those of all other *Isosoma* are white. Like those of *I. rossicum*, the larvae of *I. inquilinum* also present marked differences of form in their three stages. The larvae of the first stage attack and kill those of *I. rossicum* in their first or second stage. If several eggs of *I. inquilinum* are laid in one gall of *I. rossicum* only one larva survives; after the first moult the larvae become phytophagous. The author refers to a similar case described by Nielsen, in which the larva of a species of *Eurytoma* feeds first on the larvae of *Cryptocampus angustus*, and afterwards becomes phytophagous.

*Isosoma eremitum*, Portch.; the author describes this species and points out that it is impossible to accept the statement of Ashmead that it belongs to the genus *Philachyra*, Hal. These insects appear

exclusively on rye, and are on the wing during May and the first half of June. The eggs are mostly laid on the 4th internode, and usually singly. The larvae of *I. eremitum*, var. *nodale*, are of a paler colour than those of the typical form and resemble those of *Philachyra apterum*. They also pass into the nodes and there form a plug of gnawed particles, while the larvae of the typical form remain in the internodes. The great majority of larvae observed by the author belonged to the var. *nodale*, but the adults obtained from the two varieties were identical. The pupation of both varieties takes place in the first half of May in the following year.

*Philachyra apterum* has two distinct generations during the year; a spring variety, having wings which are scarcely visible to the naked eye, and a summer winged variety, about 15 per cent. of which, however, also have more or less shortened wings. This insect bears some resemblance to the American species *P. grande*, Riley. The adults of the spring generation appear in the fields after the middle of April; the second generation early in June, the insects remaining on the wing till the second half of the month. The females of this generation oviposit in the internodes of summer and winter-sown wheat. The adult larvae resemble those of *I. eremitum* var. *nodale*, and their life-history and the damage they do are similar. This insect differs from all species of *Isosoma* in that the larvae of the winged generation do not hibernate, but pupate at the end of summer and in autumn.

Two synoptical tables for the identification of the imagines and larvae of these species of *Isosoma* are given.

No parasites of the imagines are known, but the larval stage has many enemies, parasitic and fungoid, various fungoid diseases being responsible for the destruction of about 15 per cent. Several species of Chalcidoidea are ectoparasites of *Isosoma*, especially *Homoporus fulviventris*, Walker, fam. PTEROMALIDAE, which is found in North and Central Europe, and has two generations a year. The first generation is on the wing in the first half of July and oviposits in the internodes of wheat, where larvae of *Philachyra apterum* are present. In August, the larvae of the parasite having destroyed their host, pupate in the cells prepared by it, the pupal stage lasting from 10 to 12 days, and the imago gnaws a hole in the stem of the wheat in order to escape. The second generation attacks the larvae of *P. apterum* which remain in the fields in the stubble, and winters in the larval stage, pupating in May.

*Homoporus luniger*, Nees, has two or three generations a year. The first flies in May and June, ovipositing in galls of *I. rossicum*, and also, but less often, in those of *P. apterum*. The second generation appears in July and the larvae in the first half of August. Some of these winter and pupate in the spring, but the majority pupate in the second half of August and produce a third generation, the further fate of which is unknown.

*Eupelmus atropurpureus*, Dalm. (EUPELMIDAE) attacks *P. apterum*, *I. rossicum*, *I. eremitum*, *I. inquilinum* and also *Homoporus luniger*, being a hyperparasite of the latter. *Eupelmus degeeri*, Dalm., of which only females were found, is parasitic on *P. apterum* and on various other insects. *Decatoma mellea*, Walk. (EURYTOMIDAE), attacks *I. rossicum*.

*Homoporus* (?) *vassilievi*, Ashm. Kurdjumov considers that this

species is the representative of a new genus, related to *Rhopalicus*, to which also belong *Pteromalus einersbergensis*, Rtzb., and another species reared at the Station of Poltava from *I. noxiale.* The author has reared *H. vassilievi* as a parasite of *I. eremitum*, var. *nodale.* The mode of oviposition is different from that of all other parasites of *Isosoma*, the egg being laid not on the larvae of the host, but in the wall of the stem in that internode in which the larva of *I. eremitum* is present. After hatching, the larvae crawl for one or two days over the body of the host, and first destroy each other, the surviving larva killing the host. The larvae pupate the following spring, probably in April and May. In 1908, 82 per cent. of larvae of *I. eremitum* were destroyed by this parasite.

In addition to the foregoing, *Homoporus* sp. and *H. crassinervis*, Thoms., were bred from *I. rossicum*; *Eupelmus* sp. and *Phenacra* sp. from *I. noxiale*; *Eupelmus* sp. from *I. eremitum*; and *Eupelmus degeeri*, Dalm., and *Eurytoma* sp. from *P. apterum.*

The author has not noticed attacks on *Isosoma* by *Pediculoides* (*Heteropus*) *ventricosus*, Newp., as recorded in America, but thinks it probable that this is also the case in Russia, where these mites are often found in rye and wheat fields.

The species of *Isosoma* are widely distributed in Russia, except in the north. The author says that in Cherson the borders of the fields are more seriously infested than the centres, but the damage done by *Isosoma* to grain is less than that done by such pests as the Hessian fly, etc., *Isosoma rossicum* being the most injurious. The average loss of weight of grain attacked by *P. apterum* is only $\frac{1}{29}$, but the damage may be much greater in exceptional years.

The last chapter is devoted to remedies against *Isosoma.* The author recommends the rotation of crops, attention being paid to the possibility of these pests breeding on grasses and weeds. Stubble and straw should be burnt. As *Isosoma rossicum* and *I. noxiale* occupy the third and fourth internodes the stubble must be left of such a length as to include these parts of the plant and then burnt. *Isosoma eremitum* is usually removed with the straw, while *P. apterum* remains in the stubble. If by experiment the percentage of parasites is found to be large, they can be transported from one locality to another by simply transferring the straw or stubble.

PORTCHINSKY (I. A.). **Паразиты саранчи, прусика и вредныхъ видовъ кобылокъ изъ міра насѣкомыхъ, открытые до сихъ поръ въ Россіи. Паразиты изъ отряда жестокрылыхъ.** [Insect parasites of Locusts and of noxious Acridians found up till now in Russia. Part 1, Coleopterous Parasites.]—**«Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Admistration and Agriculture,*] *St. Petersburg*, 1914, xi, no. 1, 68 pp. 22 figs., 2 pls.

In an introduction to his work the author points out that locusts are only parasitised as eggs and imagines, these being the stages in which it is most difficult for man to deal with them. Control measures should be directed against the larval stage, which is not attacked by

parasites. All the parasites of locusts known to the author in Russia are either Coleoptera, which destroy the eggs, or Diptera, which attack both eggs and imago. The Coleopterous parasites of locusts include sixteen species of *Mylabris* and three of *Epicauta*, which are characteristic of the fauna of the steppes of south and south-east Russia, their outbreaks coinciding with and following upon the years of large outbreaks of locusts. The author illustrates this statement by instances taken from the history of locust-plagues since 1849. Having destroyed a succession of generations of locusts, these insects themselves increase largely, and do more or less damage to cultivated plants. In order to diminish the amount of damage done by them in such years, the author suggests the sowing of trap-crops, which will keep them away from cultivated fields, etc.

Some information is given regarding the biology of *Epicauta* and *Mylabris*, dealing specially with the substance—cantharidin—which is contained in their bodies, and its blistering effect on the skin. This substance is responsible for the fact that these insects are not attacked by various carnivorous animals. *Carabus* do not eat specimens of *Meloe*, but the author mentions that, according to Prof. I. K. Tarnani, the Clerid beetle, *Trichodes apiarius*, has been seen to devour *Mylabris*. At the same time some animals, frogs, hedghogs and some birds, have been proved experimentally to be able to withstand the influence of cantharidin and will devour these beetles. The author refers also to the injuries caused to cattle by eating *Mylabris*, and mentions *Mylabris frollowi*, which causes much suffering to camels in Central Asia, where the natives call it "alla-gulirek." He points out the connection existing between the poisonous qualities of these insects and their slowness of movement and bright colours, which appear to serve as a warning to predaceous animals, and refers also to instances of mimicry between *Mylabris* and moths of the genus *Zygaena*.

The oviposition of *Mylabris* is described, hard soil being selected, the egg-clusters of locusts laid in soft soil being less attacked for this reason ; the females dig a hole in the ground and lay 24 to 60 eggs, from which the larvae emerge in 20–22 days. The resulting triungulin larva and its subsequent development is described and also the various larval stages of *Epicauta*.

The author estimates that each female of *Mylabris* produces sufficient young to prevent the hatching of 325–520 locusts, and of more than 1,750 in the case of *Epicauta erythrocephala*. The following is a list of *Mylabris* spp., obtained from egg-clusters of locusts, compiled from the works of various investigators :—

*Mylabris floralis*, Pall., the most common species in European Russia, has been reared from egg-clusters of *Arcyptera* (*Stethophyma*) *flavicosta*, *Xiphidium fuscum*, *Podisma* (*Pezottetix*) *pedestris*, and *Stauronotus maroccanus*. *Mylabris* 4-*punctata*, L., from egg-clusters of *Caloptenus italicus*, *Stauronotus maroccanus*, *Locusta migratoria*, and *Podisma* (*Pezottetix*) *pedestris*. *Mylabris* 14-*punctata*, Pall., is very common in the south-eastern governments, and has been reared from egg-clusters of *Arcyptera flavicosta*, and one specimen from *Caloptenus italicus*. *Mylabris variabilis*, Pall., has been reared from *Arcyptera flavicosta*. *Mylabris sibirica*, Fisch., from *Stauronotus brevicollis*, *Stenobothrus lineatus*, and *Stauroderus* (*Stenobothrus*) *morio*. *Mylabris calida*, Pall., from *Caloptenus italicus*, *Locusta migratoria*, and *Stauronotus maroc-*

*canus*. *Mylabris ocellata*, Pall., which is similar to *M.* 11-*punctata*, Fisch., from *Caloptenus italicus*. *Mylabris crocata*, Pall., from *Stauronotus maroccanus*, and *A. flavicosta*. *Mylabris* 10-*punctata*, F., from *Caloptenus italicus* and *Stauronotus brevicollis*. *Mylabris frollowi*, Germ., from *L. migratoria*, and *Stauronotus maroccanus*. *Mylabris cincta*, Oliv., and *M. magnoguttata*, Heyd., from *Stauronotus maroccanus*. *Mylabris* 6-*maculata*, var. *ledereri*, Mars., from *Locusta*. *Mylabris geminata*, F., from *A. flavicosta*. *Mylabris tekkensis*, Heyd., and *M. fusca*, Oliv., from egg-clusters of *S. maroccanus*. *Mylabris schreibersi*, not found in Russia, but reared from egg-clusters of *S. maroccanus*, in Algiers. *Mylabris* 16-*punctata*, Gebl., quite recently reared by Bruner in Fergana from egg-clusters of *Stauronotus kraussi*, Jug.

The following three species of *Epicauta* have been reared from egg-clusters of locusts :

*Epicauta erythrocephala*, Pall., from *Caloptenus italicus*, *Locusta* and *Gomphocerus sibiricus*, L. *Epicauta sibirica*, Pall., from *G. sibiricus*, while Ingenitzky considered it to be parasitic on *A. flavicosta* and *X. fuscum*. *Epicauta megalocephala*, Gebl., from *G. sibiricus*, *Stauroderus morio*, and some other small Acridians. To this list the author adds *Epicauta ambusta*, Pall., as an almost certain parasite of small Acridians, although the fact is not yet established.

In the final chapter the author refers to the common view that locusts, especially *Locusta*, breed in dry deserts, which view has, however, lately been modified, and they are now considered to be marsh insects. He appeals to the ancient history of Egypt to show that this view was held there.

WAHL (B.). **Die Getreideblumenfliege** (*Hylemyia coarctata*, **Fall.**). [The Wheat Flower Fly (*Hylemyia coarctata*, Fall).]—*Mitteilung der K.K. Pflanzenschutzstation in Wien*, March 1914, 4 pp., 2 figs.

In the spring of 1913, samples of wheat were sent to the Station from which it is clear that this fly must now be reckoned with as a pest of wheat in Austria, and that the damage it does has probably been confused hitherto with that caused by the Frit Fly. As the life-histories of the two flies and the methods of controlling them differ, it is very necessary to distinguish clearly between them. The damage done by *Hylemyia* is noticeable in spring; it attacks wheat or rye, and more rarely barley, while oats are not attacked. The larva, like that of the Frit Fly, eats out the heart of the young plant and causes it to wither, and one larva wandering from one plant to another may attack six or more, so that not infrequently a whole field may be destroyed. The life-history of the insect is at present by no means well known. In Germany, the larvae pupate about the end of April in the earth, at a depth of about four inches, and the first generation is on the wing from the middle of May till the middle of July, but where this generation lays its eggs and the larvae of the second brood live, is still unknown, although it is believed to be on *Lolium perenne* (Rye Grass). In about four weeks the second brood is on the wing and continues into the autumn. This generation lays its eggs in autumn, not directly on the plants of winter wheat, but in the earth, and these

larvae feed on the seedlings of winter wheat, and hibernate for the most part as larvae, though possibly some may reach the imago stage and hibernate as such. The hibernated larvae begin to feed again in spring, and it is then that the damage done is most noticeable. In Denmark, the life-history of this fly is somewhat different. In that country there appears to be only one generation, and the larvae continue feeding into the month of May, when they pupate. The flies are on the wing in July and August, lay their eggs in the earth and these remain until the spring. It would appear that these eggs are not affected by flooding of the fields. Various observations tend to the belief that the attack of the fly is influenced by the treatment of the soil, and especially by the use of large quantities of stable manure. It has been observed that where this is the case, the attack on rye and wheat in autumn is frequently severe, and further, that where wheat has followed potatoes or swedes, the attack has been serious, but less so where wheat has followed rape, mangels or beans. Börner has noticed that the greatest damage is done by the fly when wheat follows clover or "timothy" grass. Röhrig says that the pest is serious when the winter ploughing of clover has not been carried deep enough at the time when the pupae of the summer brood are in the earth, or when the clover, which has been left for second crop, has been cut and the ground manured and ploughed up; he thinks that if the ploughing be deep, the larvae are so far buried that the imago cannot escape from the earth, and also that rye sown on a two to three year clover field, does not suffer from the fly if the stubble is used for pasturing sheep. In Denmark, it has been observed that the pest is more serious when the soil has been freshly ploughed in June and July, whereas similar treatment in September has the reverse effect. This system of ploughing is at present the best remedy. It is also advisable to sow winter varieties in those places where the attack is to be feared and in the case of rye, to sow somewhat more thickly than usual, so that in event of attack, a reasonable yield may be obtained; and all methods which promote the rapid and healthy growth of the plants are useful. Röhrig is further of opinion that, in the case of land devoted to clover where only one cutting is intended, only pure clover with no admixture of grasses should be sown, but in those cases in which the sowing of pure clover will not suffice, or where it is intended to keep the clover standing for two seasons, the clover stubble should be deeply ploughed in during the first half of August, as by this means the larvae attached to the grass are buried and their further development prevented. It is also advisable about the end of August to sow narrow strips of rye and to plough these in deeply after a fortnight or a month, and then to proceed with the sowing of the winter wheat. This plan answers well in Germany, but apparently is of no use in Denmark. The author points out the importance of full and detailed studies of the life-history of this fly in the particular country in which it makes its appearance, because only thus can an effectual means of attack be devised. He advises agriculturists in threatened districts of Austria to do all they can to accelerate the growth of winter-wheat so as to make it resistant, to avoid the use of stable manure in autumn on winter-wheat fields and to keep them through the summer in fallow, delaying cultivation until September.

**La** *Prospaltella berlesei.*—*Gaceta Rural, Buenos Aires,* vii, no. 80, March 1914, p. 647.

*Aulacaspsis* (*Diaspis*) *pentagona* appeared in the Argentine about 10 years ago, and has caused severe losses near Buenos Aires. Mulberry twigs infested with this scale parasitised by *Prospaltella berlesei* have now been introduced from Uruguay, whither the Chalcid was imported last year and promises to become an efficient control.

**Poltiglia solfo-calcica.** [The lime-sulphur spray.]—*Giorn. Agric. Merid., Messina,* vii, no. 3, March 1914, p. 37.

The Cattedra Ambulante di Agricoltura of Messina has enlarged its plant for the production of lime-sulphur mixture and gives the following data : Instead of direct heat, steam is used, and mechanical mixers worked by steam replace the old method of hand-mixing. These changes enabled about 1,400 cwt. more polysulphides to be turned out ; the cost of production was reduced by 25 per cent. and the price was reduced to members, from about 3*s*. 5*d*. per cwt. to about 2*s*. 8*d*. per cwt. Furthermore, the clear liquid was supplied and this is an additional advantage, for tests made by the Cattedra have proved, contrary to accepted belief, that the sediment is valueless as an insecticide.

**Scarabee or Jacobs.**—*Agric. News, Barbados,* xiii, no. 310, 14th March 1914, p. 90.

The sweet potato weevil, *Euscepes* (*Cryptorrhynchus*) *batatae*, known as the Scarabee or Jacobs, has frequently been referred to [see this *Review*, Ser. A, i, pp. 263 & 329] and is of importance, as it causes severe injury to a valuable food crop. It is difficult to control, for the larval and pupal stages are spent within the tissues of the root or stem of the plant. Slips free from infestation by either eggs or larvae of the beetle, should alone be planted, greater security being attained by producing them in a nursery. To do this, a spot should be selected where potatoes have not been grown for a long time and this should be planted with small roots taken from a field where little or no infestation is present. The first attack always occurs on the larger tubers, then the old hard portions of the stem are invaded, while the small roots are among the last parts to be infested. As the nursery beds produce vines of sufficient size and strength, they should be cut and planted, and if the nursery beds are not maintained for more than 6 to 8 months, there is very little chance of any of the slips becoming infected. After that the nursery should be forked and if no signs of scarabee infestation are visible, the same plot may be used again ; otherwise, a new nursery should be established. A field of sweet potatoes planted from such a nursery should be quite free from scarabee for some time and might be used as a source of slips for planting, provided these were taken at the earliest possible date, since the danger increases with the age of the plants.

**Destruction des pucerons noirs de la betterave.** [The destruction of the black aphis of the beetroot.]—*Jl. d'Agric. pratique, Paris,* xxvii, no. 11, 12th March 1914, p. 349.

In reply to a correspondent whose beetroots have been attacked

by *Aphis papaveris*, F., the following insecticide, suggested by M. Malaquin [see this *Review*, Ser. A, i, p. 188] and tested in the North of France, is mentioned: Black soap 2 lb., sodium carbonate 2 lb., petroleum $2\frac{1}{2}$ to $3\frac{1}{2}$ pints, water 20 gals. The soap and sodium carbonate are dissolved in 2 gals. of hot water and the petroleum is then added with vigorous stirring for about 15 minutes. The remaining 18 gals. of water are then added and the whole thoroughly stirred again. This solution is sprayed on the plants so as to reach the underside of the leaves as much as possible. *A. papaveris*, F., is markedly polyphagous. It deposits its eggs on *Euonymus*, and if plantations of the latter are near the beet fields they should be destroyed, or if this be impossible, thorough pruning, followed by the burning of the débris, will ensure the destruction of many eggs. Should these measures be impracticable, the trees should be sprayed with the following petroleum-soap emulsion: petroleum $3\frac{1}{2}$ pints, water $1\frac{3}{4}$ pint, soap 6 oz. This must be prepared as usual and diluted for use with 7 to 8 times its bulk of rain-water.

LESNE (P.). **Insectes nuisibles aux arbres fruitiers. Les tenthrèdes et leur destruction.** [Insect pests of fruit trees. Sawflies and their destruction.]—*Jl. d'Agric. pratique, Paris*, xxvii, no 12, 19th March 1914, pp. 376-377.

The larvae of *Eriocampa limacina*, Retz., are the best known of the many larvae of TENTHREDINIDAE feeding on the leaves of fruit trees, and are called slug-larvae, because of the viscous appearance of their bodies. In summer, and especially in September and October, they are found on many fruit trees, chiefly on the pear and cherry. They are usually seen on the upper surface of the leaves, which they skeletonize, and if present in numbers on the pear, may affect the ripening of the fruit.

In October they enter the ground, where they pass the winter and part of the spring in a cocoon, pupating the following summer. The female oviposits on the underside of the leaves, and sprinkling the leaves with freshly slaked lime is generally advised. In the morning, while still inert, the adults may be shaken down into a Haltica funnel to the nozzle of which a bottle containing some petroleum is fitted. Once the fruit has been picked, arsenicals may be used on cherry-trees provided they are not in a vegetable garden. *Lyda flaviventris*, Retz., has very different habits. Its larvae live in families in loosely woven silken nests on the branches of the apple, pear, etc. These nests occur in June and July, and extend along the branches as the leaves they enclose are consumed. The larvae enter the ground in August and the adults appear in the following May or June. Petroleum-soap emulsions are an efficient control. Any of the usual formulae may be used or one may be made up of: Petroleum $11\frac{1}{2}$ pints, soap 9 oz., rain-water 7 pints; the water is brought to boiling point and the soap dissolved in it; the mixture is then removed from the fire and poured into the petroleum and stirred until a creamy liquid results. For use this solution is diluted with 15 times its bulk of water. A test should always be made to see that the spray does not injure the foliage.

Elegi (S.). **Il metodo Lotrionte vittorioso contro la mosca dell'olivo.** [Lotrionte's method victorious against the olive-fly.]—*Riv. Agric., Parma*, xx, no. 11, 13th March 1914, pp. 167–169.

The present article gives the two principles on which Lotrionte based his system, which has already been described [see this *Review* Ser. A, ii, pp. 289 and 452]. (1) A solution of glucose is more attractive to the fly than one containing molasses; (2) a 1 per cent. copper sulphate solution is more deadly to the fly than one of either sodium or potassium arsenite. Other workers used these latter poisons, with molasses as the bait, and attained but little success (but see references above). The "capannette" or covers peculiar to this system also permit expenses to be cut down to a minimum.

South (F. W.). **Report on the work of Locust Destruction, January to March 1914.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 9, April 1914, pp. 227-230.

In this report the author describes the division of the Selangor State for this purpose and the methods followed. From early in January the flying swarms were kept under observation, in order that oviposition centres might be known. Later in the month, large numbers of gravid females were destroyed by shaking them off bushes and trees at night into sacking spread below. The insects were known to have finished egg-laying by January 30th. The first batches were found on January 22nd. The larvae began hatching on February 1st, and on February 13th and 23rd, in the north and south parts of the State respectively, destruction was begun. In the northern part, by March 12th, the locusts were considerably reduced, about 16 large swarms having been dealt with, and it is hoped that the danger of locusts spreading into Perak is now over, though unknown jungle swarms may give trouble. Similar efforts were made in South Selangor and the total catch in the State between February 13th and March 15th was 3,314 tins, representing about 65 swarms. Similar results were obtained in Negri Sembilan. The author expects that by the end of six months these States will be approximately free from locusts, and that any swarms left will be small and scattered.

South (F. W.). **Agricultural Pests Enactment, No. 13 of 1913.** (*Continued.*)—*Agric. Bull. Fed. Malay States*, ii, no. 9, April 1914, pp. 220-224.

This article deals with the remaining sections of the Enactment [see this *Review*, Ser. A, ii, p. 391.] Under the heading "Special Quarantine," land on which diseased plants are growing may at the discretion of the Director of Agriculture, and with approval of the President of the State, be put in quarantine, and in these circumstances no plants may be removed without permission. The immediate notification of the presence of locusts by the occupiers of land so infested is required. Regarding the introduction of pests or diseases from abroad, rules may be made by the Chief Secretary prohibiting the landing of any animal or plant likely to introduce any pest, or providing for the treatment or destruction of any such plant or animal. Attention is called to a rule requiring the notification of the

presence of *Brachartona catoxantha*, a caterpillar pest of coconuts, within 14 days of its discovery.

Porter (C. E.). **Dos insectos útiles á la agricultura.** [Two insects beneficial to agriculture.]—*Rev. chilena de Historia Natural, Santiago (Chili)*, xvii, nos. 1 & 2, April 1913, pp. 98-99. [Received 8th April 1914.]

The author has recently observed two beneficial insects: *Coccidophilus citricola*, Brèthes, a Clavicorn beetle new to Chili, discovered in 1905 at Buenos Aires, where it appeared to feed exclusively on *Lepidosaphes beckii;* the other insect is a small Hymenopteron not yet identified.

Korolkov (D. M.). **Вредныя для сада и огорода насѣкомыя и мѣры борьбы съ ними.** [Insects injurious to orchards and market-gardens and remedies against them.] — **«Садъ и Огородъ.»** [*Orchard and Market-Garden,*] *Moscow*, no. 5, May 1914, pp. 235-241.

The author gives some general information on pests of orchards and market-gardens likely to appear during the summer: *Byturus tomentosus*, F. [see this *Review*, Ser. A, ii, p. 368] and *Anthonomus rubi*, Herbst, which oviposits on the buds of raspberries and strawberries, the females injuring the petiole of the buds, so that they cannot unfold; the larva feeds inside the closed bud and pupates there. The author recommends the shaking down and destruction of the injured buds.

*Incurvaria rubiella*, Bjerk. Besides spraying early in spring with milk of lime, the cutting in autumn of the raspberry canes and their destruction by burning, is recommended.

*Incurvaria capitella*, Cl. The same remedies are advised as against *I. rubiella*, as well as the removal and destruction of the premature red currant berries, which contain the larvae.

*Zophodia convolutella*, Hb. The removal and destruction of attacked berries and the cultivation of the soil underneath gooseberry bushes in autumn and spring is recommended; also spraying with Paris green against various larvae.

*Pieris brassicae*, L. The eggs must be destroyed by crushing them on the cabbage leaves, and the larvae collected by hand.

*Aphis brassicae*, L. The best remedy is spraying with green soap (1 lb. of soap dissolved in 11 quarts of water).

Sevastianov (I.). **Къ вопросу о мѣрахъ истребленія марокской кобылки въ Туркестанѣ.** [On the question of the means of destroying *Stauronotus maroccanus* in Turkestan.]— **«Туркестанское Сельское Хозяйство.** [*Agriculture of Turkestan,*] *Tashkent*, no. 5, May 1914, pp. 477-492.

The author reports on a new "locusticide" prepared by the firm of Rublev, in Theodosia, his experiments being conducted by instructions of the Turkestan Entomological Station in order to test whether it can replace Paris green. This mixture is sold in tins containing about 18½ lb. of the solution, consisting of about 10 lb. of molasses, and 5 lb. of $Na_2HA_5O_3$, the residue being water. He mentions the dis-

advantages of Paris green, which is easily washed down by rain or blown away by wind and chokes the sprayers, and also refers to some previous experiments by Sijazov [see this *Review*, Ser. A, ii, p. 37] and to the history of "Atlas" locusticide in South Africa.

His experiments were conducted in May 1913, on a spot near the Station Dragomirovo, in the district of Chodzent, where egg-masses were noticed in the previous autumn. Various stages of hoppers were found at this time, the insects keeping in small scattered swarms. He mentions that the available petroleum torches proved quite worthless and that they are not to be used this year. He experimented first with hand-sprayers and afterwards with horse-drawn ones. For the hand-sprayers he used a solution of about 21 ozs. of the locusticide in 27 gallons of water and stronger solutions, and varied the size of the areas on which a given amount of the locusticide was used. He refers to the difficulties of ascertaining exactly the percentage of hoppers destroyed, but concludes that, on the whole, the results must be considered satisfactory, notwithstanding the rain, which fell 26 hours after the spraying took place.

With horse-drawn sprayers, he used solutions of from 1 to $2\frac{1}{2}$ lb. of $Na_2HA_5O_3$ to about 70 gallons of water, and the results were highly satisfactory. The death of the locusts began 7 to 8 hours after the spraying and 3 days later, the destruction of the pests was practically complete, but on this occasion the weather remained fine. Some adjoining plots were sprayed with Paris green, but the results were less satisfactory.

The author further points out that the cost of this remedy is not higher than that of Paris green.

Borodin (Dr.). **О нашествіяхъ гусеницы лугового мотылька или сѣраго червя.** [The invasions of caterpillars of *Phlyctaenodes sticticalis.*]—**«Хуторянинъ.»** [*Chutorianin,*] *Poltava,* no. 20, 28th May 1914, pp. 593-594, 3 figs.

The author warns the agriculturists of the possibility of a large outbreak of *P. sticticalis* in 1914, similar to that which took place in 1901 in 22 governments of European Russia. He gives a popular account of these pests, their breeding habits, damage done, etc., and figures the various stages.

He further describes the usual remedies: spraying with barium chloride and with Schweinfurt green, giving recipes for the preparation of these mixtures; hand-picking; spraying the caterpillars with carbolic or kerosene emulsion or tobacco-extract. He also refers to the usual preventive remedies: trenches round fields and plantations, sticky belts, etc.

Dafert (F. W.) & Kornauth (R. R. Karl.). **Bericht über die Tätigkeit der k. k. landw.-chemischen Versuchsstation in Wien im Jahre 1913.** [Report on work done at the Imperial and Royal Agricultural Chemical Research Station in Vienna in the year 1913,] pp. 80-95. [Received 19th June 1914.]

Aphids caused serious damage during the year, especially to beet and hops, and were very difficult to control on the former except on the seedlings; on hops, tobacco-soap sprays were found effective.

This method of treatment is reported to be gaining ground rapidly in Bohemia, in spite of the relatively high cost of the spray material; experiments are in progress with Demilysol and other insecticides in the hope of finding something cheaper and at the same time as effective as the tobacco spray.

*Hylemyia coarctata*, Fall., is now to be definitely regarded as a pest of cereals in Austria, and fears as to its spread are expressed, for it is more or less clear that the insect has been present unrecognised in Austria for some time, and the damage done has been attributed to *Oscinis frit*. From Bohemia, complaints have been received of a new pest of cereals, *Trachea* (*Hadena*) *basilinea*, F. In Dalmatia, *Stauronotus* (*Dociostaurus*) *maroccanus*, Thbg., has appeared in increasing numbers. Large quantities of *Rhynchites pauxillus*, Germ., have been taken on apple trees near Krems, and *Cheimatobia brumata*, L., was reported from many districts in the spring of last year. The Lasiocampid moth, *Dendrolimus pini*, L., appeared again in the neighbourhood of Wiener-Neustadt, and in Bohemia, *Panolis flammea*, Schiff., (*griseovariegata*, Goeze) frequently in company with *Bupalus piniarius*, L., has done a good deal of damage. The larvae of the former are apparently attacked by an as yet undescribed form of fungus which has kept them in check.

*Isosoma orchidearum*, Westw., has been found on Cattleyas in orchid houses in Graz and *Pseudococcus nipae*, Mask., on Kentias in a greenhouse in Vienna.

*Heliothrips haemorrhoidalis*, Bché., on Kentias was successfully treated with lime-sulphur mixture, diluted with 35 volumes of water and sufficient tobacco-extract to form a $1\frac{1}{2}$ per cent. solution. Lime-sulphur diluted with 20–30 andeven 40 volumes of water was also found effective against *Tetranychus* sp., infesting ivy, though how far this is to be regarded as a preventive is not yet demonstrated. Cyanide fumigation was tried against *Trioza alacris*, Flor, on laurel with complete success, but *Aonidia lauri*, Bché., resisted this treatment to a very considerable extent. The American (1 : 1 : 3) formula and method was used. The results of the examination and trial of a number of proprietary and other insecticides are given at length, amongst these are "XEX," Raupas, Creolinum viennense, Lysokresol, Lohsol, Sotarbor, Pyridinoleate and Cupran.

Shishkin (K.). **Насѣкомыя, собранныя въ канавкахъ въ Кіевскомъ лѣсничествѣ.** [Insects collected in trap trenches in the Forests of the Govt. of Kiev.]—**« Энтомологическій Вѣстникъ.»** [*Herald of Entomology*,] *Kiev*, ii, no. 1, 1914, pp. 44-51.

The author gives a list of insect species most largely represented in the trial trap-trenches at Puschtscha-Woditza, of the Kiev forestry district. The trenches were 11 inches wide and 15 inches deep. At intervals of about $9\frac{1}{2}$ yards trap-pits, 11 inches square and 15 inches deep were arranged. Curculionidae were the most numerous, and of these *Hylobius abietis*, L., formed 67 per cent., *Coniocleonus glaucus*, var. *turbatus*, Fahrs., 24 per cent., *Lepyrus capucinus*, Schall, 6 per cent., and *Cyphocleonus tigrinus*, Panz., 3 per cent. Other Curculionidae were found in negligible quantities. On the 12th June 1909 all the beetles present in the traps were counted. The species named above numbered

7,200 individuals, other CURCULIONIDAE 306, CARABIDAE 460, TENEBRIONIDAE 92, STAPHYLINIDAE 14, COCCINELLIDAE 7, DERMESTIDAE 17, ELATERIDAE 20, BUPRESTIDAE 5, CERAMBYCIDAE 9, and SCARABAEIDAE 12.

LEBEDEV (A. G.). **Дополненіе къ статьѣ К. Шишкина.** [Note to the article by K. Shishkin.]—**« Энтомологичекій Вѣстникъ.»** [*Herald of Entomology.*] *Kiev*, 1914, ii, no. 1, pp. 52-53.

The author, commenting on the list of insects collected by Shishkin in trap-trenches against *Hylobius abietis*, points out that it has never been observed that any species of *Carabus* would devour specimens of *Hylobius*. He mentions that *Carabus menetriesi* was also found by Olsufiev in the governments of Volhynia and Tchernigov, in trenches dug in pine woods, and concludes that this species cannot be regarded as dying out and that it must have a wider range than is usually thought.

LEBEDEV (A. G.). **Критико-библіографическій отдѣлъ.** [Reviews of books.]—**« Энтомологическій Вѣстникъ.»** [*Herald of Entomology.*] *Kiev*, 1914, ii, no. 1, pp. 87-101.

A. G. Lebedev reviews the work of I. I. Troitzky on the biology of *Epicometis* (*Tropinota*) *turanica*, Reitt., (see this *Review*, Series A, i, pp. 437–438) and deals also with the same author's "Materials for the biology of *Rhynchites auratus*, Scop." The oviposition of the latter is described as studied in 1905 in his laboratory, the insect having appeared in fairly large numbers near Kiev in that year. Having started to bore the pericarp, the female does not take out its proboscis, till the hole is quite finished ; it turns its head in all directions so as to enlarge the hole and give it a conical form. It does not gnaw through the whole of the pericarp, but leaves a thin part of the woody stratum. Immediately the hole is ready, the female deposits an egg in it and begins to build the plug. It does not make a circular channel, as described by Schreiner and Troitzky, but gnaws away small pieces from the walls of the soft pericarp and fills the hole with them, kneading them slightly with its proboscis ; the round channel mentioned by other authors is formed by the drying and shrinking of the plug, which causes it to separate from the uninjured walls of the pericarp. In the laboratory the development of the larva of *R. auratus* lasted 7–8 days, the greatest number of eggs laid by one female being 120.

NECHLEBA (—). **Der Forleulenfrass im Reviere Woleschna 1913.** [The ravages of the pine moth (*Panolis piniperda*, Prez.) in the Woleschna woods in 1913.]—*Vereinsschr. Forst-, Jagd- u. Naturkunde, Prague*, 1913-1914, nos. 11 and 12, March & April 1914, pp. 614-633, 1 map.

An account is given of the ravages of the pine moth (*Panolis piniperda*, Prez.) in the pine woods of Woleschna, in Bohemia. The district is divisible into three small valleys, the centre of the outbreak being in the middle, and the damage spreads from west to east, owing to the prevailing west winds. The trees which are completely defoliated are mostly from 60–65 years old, though some 90-year-old trees have

suffered equally severely ; on the outskirts of the forest, the foliage is only partially devoured. In the worst parts, the author estimates that there are at least 1,000 caterpillars per tree, but of these only 10 per cent. arrive at the adult stage, owing to the attacks of parasites (chiefly Tachinids and Ichneumons) and fungoid diseases, such as flacherie. The author regards as useless, or at least insufficient, the usual methods of destroying the larvae and pupae in the ground, or turning pigs, hens, etc., into the woods to eat up the pupae. He considers that the proportion of the caterpillars that can be killed artificially is negligible, compared with that which is destroyed naturally by insect-eating birds and insect-parasites.

Quaintance (A. L.). **The Control of the Codling Moth in the Pecos Valley in New Mexico.**—*U.S. Dept. Agric., Washington D.C.,* Bull. no. 88, 8 pp., 4 figs.

Fruit-growers of this valley have for some years complained to the U.S. Bureau of Entomology that control methods which are successful in other apple-growing regions, do not prevent a large proportion of their apples and pears from being attacked by the codling-moth and rendered unsaleable. It was thought that the poor results of spraying operations were due to the manner of application, rather than to a difference in the life-history of the moth. In the spring of 1912, an investigation was undertaken by Mr. A. G. Hammar, but owing to his death the results have been prepared for publication by the author. The life-history studies will be dealt with in another paper, the results of the spraying during 1913 being recorded here. A five-acre portion was divided into four plots, which were variously treated, one plot being left as a control. In the first treatment, Bordeaux nozzles were used and 16½ gallons per tree at 225 lb. pressure were given, the mixture being 6 lb. lead arsenate to 200 gallons of water. In the second and subsequent treatment, Vermorel-type nozzles were used, and a mixture of 8 lb. arsenate of lead to 200 gallons of water. These sprays were probably stronger than those used locally. A table is given showing the percentage of sound fruit from each of 5 trees of each plot, varying from 99·39 per cent., in the most successful, to 40·77 in the control plot. It is concluded that if thoroughly done, three sprayings would keep the codling-moth injury below 5 per cent. of the total crop. The increased improvement due to further applications is probably hardly profitable.

The author deals next with the position on the young apple at which the larvae enter, in sprayed and unsprayed examples It is evident that the spray given immediately the petals fall is by far the most important, and subsequent sprayings cannot make up for its neglect. Usually there is a period of about 10 days after the fall of the petals before the calyx closes, but in New Mexico the calyx remains open for two or three weeks according to the variety and season. Thus the second spray can be directed into the calyx cups and will supplement the first spray. A third table is given showing the relative numbers of larvae entering the fruit at the calyx, side and stem. Some Western entomologists, after experimenting with codling moth under arid conditions, recommend a coarse spray directly

the petals drop, while, under Eastern conditions, comparative tests show little difference in the effectiveness of coarse and fine sprays. Good results have been yielded by barrel-sprayers working at 100 to 120 lb. pressure. The great necessity of thoroughness when giving the treatment immediately the petals drop is emphasised, and the use of an elbow on the end of the spray rods is advised to enable the poison to enter each calyx cup. The second application should be made before the calyx lobes are more than $\frac{3}{4}$ closed, about a fortnight later. This spray should also enter the calyx cups and coat the leaves and fruit, the third spray, 8 or 9 weeks after the first, covering the fruit and foliage as uniformly as possible.

STENE (A. E.). **The Tent Caterpillar and the Fall Webworm.**—*Rhode Island Sta. Bd. Agric.* [Circular dated Providence, 1914]. 8 pp. 3 figs.

The tent caterpillar (*Malacosoma americana*) is a native insect, feeding principally on black cherries, choke cherries and apples, and is sometimes found on peach, plum, oak and willow. The eggs are deposited in the autumn and the larvae develop somewhat, but do not actually hatch until spring, when they begin to make their conspicuous tents. The nests should be taken by hand or wound on a broom and dropped into a pail containing water and kerosene. Should the tree be of no value, spray the nests with kerosene, while the caterpillars are in them and set fire to the trees. In orchards, spray with arsenate of lead as soon as the leaves are large enough. The caterpillar has both predaceous and parasitic enemies, and suffers from the wilt disease, and these usually keep it in check. It is predicted that the species will be less abundant this year. The autumn webworm (*Hyphantria cunea*), is sometimes confused with the foregoing species, the brown-tail and the gipsy moth. The webs of this species are found only on the tips of the branches and appear late in summer. They are loosely made and enclose the leaves on which the larvae are going to feed. The moths emerge in May and June. It is best, if possible, to remove the infested branch and burn it, otherwise arsenate of lead sprayed round the nest should eventually kill the caterpillars.

WAHL (C. VON). **Die Borkenkäfer an den Obstbäumen und ihre Bekämpfung.** [The Bark-Beetles of fruit trees and method of combating them.]—*Haupstelle f. Pflanzenschutz in Baden an der Groszh. landwirtsch. Versuchsanst., Augustenberg, Flugblatt* no. 3, Jan. 1914, 4 pp.

It is not an uncommon thing in certain years to find fruit trees whose bark is full of bored holes and the crowns or branches of which die off. The holes are easily noticeable because of the frass entangled in sap and gum which runs down from them. The author describes *Scolytus pruni*, Ratz., which especially attacks plums, damsons and apples and also cherries, pears, bird cherry (*Prunus avium*), white-thorn, ash, elms and even vines. The female bores through the bark to the cambium and then makes a vertical gallery $2\frac{1}{2}$ ins. by 5 ins. long. in which 60 to 80 eggs are laid. The larvae on hatching, bore tunnels at right angles to the original gallery, at the end of which they pupate

in a small enlargement. One generation completes its life-cycle in from 11 to 12 weeks, but if conditions are favourable a second generation may be completed in August or September. Hibernation takes place in the larval stage. *S. rugulosus*, Ratz., attacks much the same trees as the previous species, but prefers plums, damsons and apricots, and also feeds on white-thorn and mountain ash. *Xyleborus dispar* will attack deciduous trees, but prefers fruit trees, oaks and beech, and also occurs on vines, roses, and many other trees. According to climate and situation, the appearance of imagines takes place from April to May and, as the period of oviposition is prolonged, both larvae and adults may be found in the burrows in summer and autumn.

*Xyleborus saxeseni*, Ratz., attacks fruit trees and other deciduous trees, but also firs, pines, and larches. From 80 to 120 eggs are laid by each female. As the eggs are laid gradually during the summer, every stage of the insect is to be found together, but in winter only beetles and larvae. The time of flight, according to climate and locality, is from about the end of May till the middle of June, and if conditions are favourable, a second generation may appear in August. These borers are parasitised by *Blacus fuscipes*, Gour., and *Pteromalus bimaculatus*, Nees. Insect-eating birds also reduce their numbers considerably. The larvae are liable to certain fungus-diseases which kill considerable numbers. The author suggests as remedies, increasing the resisting power of the trees by careful manuring ; painting the trees with lime which protects them from the sun and from frost ; protection of the roots against the attack of rats, and other rodents ; moderate root-pruning ; the ringing of sickly valueless trees for use as traps to attract the beetles ; the complete destruction of all dead trees, or those which have been seriously attacked, as well as the trap trees, before the beetles begin to travel. The best time for this is between October and April, when they are in their winter quarters. Binding the trunks and branches of the trees with some thin cheap packing material will prevent the pests from boring. The use of bait-traps filled with diluted apple-juice about the time of the flight of the beetles, that is between April and August, and smearing the trunks with a mixture of fruit-tree carbolineum to prevent the beetles from ovipositing, are also useful, but the latter must not be applied to buds and new wood. In the case of specially valuable trees and bush fruit, which have not been seriously attacked, carbon bisulphide may be injected into the burrows.

Muller (K.) **Wirkt die Kupferbespritzung auf das Gedeihen des Weinstockes nachteilig?** [Does spraying with copper act injuriously upon the growth of vinestocks ?]—*Hauptstelle f. Pflanzenschutz in Baden an der Groszh. landwirtsch. Versuchsanst. Augustenberg, Flugblatt* no. 4, Feb. 1914, 2 pp.

Professor Endriss, of Stuttgart, has stated in the agricultural press of Würtemburg and elsewhere, that the spraying of vines with copper solutions against *Peronospora* has had most disastrous results, diminishing the yield and indirectly ruining the vine-stocks. The author examines certain cases cited and shows that there is no real reason for this opinion, and he says that vineyards which for more than 10 years have been diligently sprayed with Bordeaux mixture

have not only improved, but that the growth of the vines has been strengthened, whilst these same vineyards when the spraying was stopped or was intermittent, deteriorated, large numbers of the vines dying. He advises vine-growers to continue spraying.

Ghosh (C. C.). **Life-Histories of Indian Insects. Lepidoptera.**—*Mem. Dept. Agric. India, Pusa*, v, no. 1, April 1914, pp. 1-72, 9 pl., 1 fig.

Accounts of the life-histories and habits are given of eleven species of Indian butterflies, seven of which are of economic importance.

*Melanitis ismene*, the "Rice Leaf Caterpillar," has a wide distribution in India. Rice (*Oryza sativa*) is its usual food-plant, but it also feeds on Juar (*Andropogon sorghum*). The eggs are laid on the under-surface of the leaves, singly or a few together; the larvae hatch in three days, the larval period being about 23 days, and the pupal period 10 days.

*Ergolis merione*, the "Castor Spring Caterpillar," is a minor pest of castor oil plants (*Ricinus communis*) and is not likely to become a serious one, though it has a wide distribution.

*Pieris brassicae* is distributed in the Himalayas from Chitral to Bhutan up to 10,000 feet. In the neighbourhood of Pusa, the caterpillars cause serious damage to cruciferous plants. The caterpillars are attacked, but ineffectively controlled, by a Tachinid and also by a Hymenopterous parasite.

*Papilio demoleus* and *P. pammon*, the larvae of which are known as "lemon caterpillars," on account of the damage they do to Citrus trees, defoliate young trees completely, and devour the leaves of fully grown trees, without, in the latter case, being very injurious. Particulars of their wide distribution and the duration of the larval and pupal stages are given. Both species are largely parasitised by three minute Hymenoptera; of 245 eggs collected between 4th and 25th April, 30 per cent. were attacked, and from 65 caterpillars collected at the same time, two Tachinid flies were bred.

*Catochrysops cnejus*, the "Tur Hairstreak," occurs throughout India, except at very high elevations. It is probably on the wing throughout the year and the larva feeds on the flower-buds or beans of many leguminous plants. The duration of the life-cycle varies according to temperature, from 19 to 32 days. One species of *Ichneumon* has been found to be parasitic on the larvae. Extent of parasitism not stated.

*Parnara* (*Chapra*) *mathias*, the "Rice Skipper," is a minor pest of rice and grasses, and is distributed throughout India; the life-cycle occupies from a little over a month in summer, to 3½ months in winter. It hibernates in the larval stage. The caterpillars are parasitised by several Hymenoptera and Diptera, and are preyed upon by the Pentatomid bug, *Andrallus spinidens*.

**Cutworm Investigations in Southern Alberta.**—*Agric. Gaz., Canada, Ottawa*, i, no. 4, Apr. 1914, pp. 275.

The field investigations made by Gibson and Strickland in 1913 showed that the species causing most of the damage to the growing crops

had not previously been regarded as an economic pest, namely, *Porosagrotis orthogonia.* Control is difficult, as this species appears to feed just below the surface. Infested fields were divided into plots, which were treated with various strengths of Paris green, salt and sugar, mixed with bran, lead arsenate and London purple; the best results were obtained by the Paris green, the poisoned bran varying in its efficiency. Dipterous parasites have been reared in the laboratory from cut-worms taken in the field, and these are believed to be a natural control. Further investigations are being undertaken.

BAGNALL (R. S.). **A Chalcid parasitic on Thrips.**—*Rept. Brit. Assn. Adv. Sci.* 1913, *London*, 1914, p. 531.

The author has observed minute black and white Chalcids, which he regarded as having some relation with Terebrantian Thysanoptera. In August 1913, many specimens of this Chalcid were found in the flowers of toad-flax at Hele Bay near Ilfracombe, in close relation with larvae of *Taeniothrips primulae,* and *Physothrips atratus.* These Chalcids proved to be *Thripoctenus russelli,* which is parasitic on *Thrips tabaci* and *Frankliniella tritici.*

VUILLET (A.). **Note sur un Chalcidien Parasite du Thrips des Pois.** [Note on a Chalcidid Parasite of the Pea thrips.]—*C. R. Soc. Biol., Paris,* lxxvi, no. 13, 10th Apr. 1914, pp. 552-554, 1 fig.

From the biological point of view, the Thysanoptera have received only a small degree of attention, and only two parasites have been described and recorded from species of economic importance, viz., *Tetrastichus gentilei,* from the olive thrips, *Phloeothrips oleae,* and *Thripoctenus russelli,* from the bean thrips, *Heliothrips fasciatus.* The author in the present paper records and describes a new species of Chalcidid, *Thripoctenus brui,* parasitic on the pea thrips (*Frankliniella robusta*). The specimens from which the description has been made were taken from larvae and imagines of *F. robusta* on the flowers of peas, sweat pea and bean at Dercy (Aisne) in July 1913.

BOGOLIUBOV (S.). **Вредъ отъ тля и борьба съ нею.** [The damage done by Aphids and remedies against them.]— **«Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan,*] *Tashkent,* no. 5, May 1914, pp. 510-514.

The author refers to the damage done in Turkestan to various plants by *Aphis gossypii,* Glov., and by *Aphis brassicae,* and gives some general information on their biology, parasites, etc. He reports on his experiments against them with kerosene-lime emulsions which gave very good results. The experiments were conducted in a market-garden, where cucumbers and melons have seriously suffered from these pests. He recommends the following recipe for the insecticide: $\frac{1}{4}$ lb. of kerosene, $\frac{1}{4}$ lb. of lime, slaked in about 8 oz. of water, the whole to be made up to 11 quarts with water; when carefully handled no repeated sprayings will be necessary. The cost of about 540 gallons of this insecticide, which will suffice for 200 to 250 plants will be only about 4*s.* 2*d.* In order to avoid burning the plants, the spraying must be done before 8 a.m. and after 5 p.m., before dark.

CONTENTS.



(C46.)

VOL. II. Ser. A. Part 8.—pp. 489-528. AUGUST, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.

THE EARL OF CROMER, G.C.B., O.M., G.C.M.G., *Chairman.*

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.

Mr. E. E. AUSTEN, Entomological Department, British Museum (Natural History).

Dr. A. G. BAGSHAWE, Director, Tropical Diseases Bureau.

Sir J. ROSE BRADFORD, K.C.M.G., F.R.S., Secretary, Royal Society.

Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., A.M.S.

Dr. S. F. HARMER, F.R.S., Keeper of Zoology, British Museum (Natural History).

Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.

The Hon. Sir JOHN MCCALL, M.D., Agent-General for Tasmania.

Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.

Sir JOHN MCFADYEAN, Principal, Royal Veterinary College, Camden Town.

Sir PATRICK MANSON, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.

Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.

Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.

Professor G. H. F. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.

Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.

Lieutenant-Colonel Sir DAVID PRAIN, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.

Mr. H. J. READ, C.B., C.M.G., Colonial Office.

The Honourable N. C. ROTHSCHILD.

Mr. HUGH SCOTT, Curator in Zoology, Museum of Zoology, Cambridge.

Dr. A. E. SHIPLEY, F.R.S., Master of Christ's College, Cambridge.

Sir STEWART STOCKMAN, Chief Veterinary Officer, Board of Agriculture.

Mr. F. V. THEOBALD, Vice-Principal, South Eastern Agricultural College, Wye.

Mr. J. A. C. TILLEY, Foreign Office.

Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

### General Secretary.

Mr. A. C. C. PARKINSON (Colonial Office).

### Director and Editor.

Mr. GUY A. K. MARSHALL.

### Assistant Director.

Mr. S. A. NEAVE.

### Assistant Editor.

Mr. W. NORTH.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

Duport (L.). **Notes sur Quelques Maladies et Ennemis des Plantes Cultivées en Extrême Orient.** [Notes on certain Diseases and Enemies of Cultivated Plants in the Far East.]—Extrait du *Bulletin Economique de l'Indochine, Hanoi-Haiphong,* Nouvelle Série, no. 99, Nov.-Dec. 1912, et nos. 102, 105, May-June, Nov.-Dec. 1913, 147 pp.

The author says that, with the exception of *Phylloxera* and *Hemileia vastatrix*, there are no enemies or diseases of cultivated plants in the Far East which threaten complete destruction of any particular crop, but that, nevertheless, nearly every form of cultivation is subject to the attack of some parasite. Up to the present the principal work on this subject in the Far East has been done by the Botanical Garden at Buitenzorg, the Agricultural Research Institute at Pusa and the Bureau of Science at Manila.

Twenty-two pages of the work are devoted to a detailed statement of the fungus parasites of the various cultivated plants of Tongking. A chapter is contributed by the Abbé J. de Joannis as to the best means of capturing and despatching insect specimens, followed by a list, covering eleven pages, of 271 species of Lepidoptera known to be injurious to vegetation in the Far East, with the plants they attack.

The author then gives a list of the principal agricultural pests in the Far East, compiled from the literature on the subject. Only those pests of the more important crops reported from Tongking are here dealt with.

Rice is attacked by the following:—*Schoenobius bipunctifer*, Wlk., and *Sesamia inferens*, Wlk., the larvae of which bore into the stems of rice, sugar-cane, millet, maize, etc., and against which flooding of the rice-fields is recommended. *Cnapholocrocis medinalis*, Gn., is a minute species, the larvae of which bore into the stems. All rice stems which show signs of attack should be pulled up and burnt. The leaves are attacked by the caterpillars of several Lepidoptera, including *Mycalesis mineus*, L., *Precis* (*Junonia*) *almana*, L., *Parnara mathias*, F., *Padraona dara*, Koll., *Telicota augias*, L., *Diacrisia obliqua*, Wlk., *Amsacta lactinea*, Cr., *Chloridea obsoleta*, F., *Cirphis loreyi*, Dup. (which is one of the most dangerous species), *Cirphis unipuncta*, Haw. (also a formidable pest), *Prodenia litura*, F., *Spodoptera mauritia*, Bd. (against which trap-trenches should be dug), *Mocis* (*Chalciope*) *frugalis*, F., *Grammodes* (*Chalciope*) *geometrica*, F., *Dasychira securis*, Hb., *Dinara* (*Antycira*) *combusta*, Wlk., *Artona walkeri*, Moore, *Doloessa viridis*, L., *Ancylolomia chrysographella*, Koll., *Pyralis pictalis*, Curt., *Nymphula fluctuosalis*, Z. Other pests include:—*Hispa aenescens*, Baly, and *Tetroda histeroides*, F. (an Hemipteron which feeds on the grains). *Leptocorisa varicornis*, F., does considerable damage; when very numerous on rice, dragging a net, of rather large mesh, which is kept stretched over the heads of rice, will catch a large number of them. Although their nauseous smell protects them from the attacks of birds, they are preyed upon by *Cicindela sexpunctata*, L. *Leptocorisa acuta*, Thunb., does similar damage to the last-named.

Maize is attacked by many of the above-mentioned Lepidopterous rice-pests and also by *Chilo simplex*, Butl., *Parnara conjuncta*, H. S., *Diacrisia strigatula*, Wlk., *Laphygma exigua*, Hb., *Elydna reclusa*, Wlk.,

(C55) Wt. P86/57. 1500. 8.14. B.&F.Ltd. Gp.11/3.

*Zinckenia fascialis*, Cr., and *Marasmia trapezalis*, Gn. In maize received from the Ivory Coast, nearly every grain was attacked by two small Coleoptera *Tribolium navale* and *Gnathocerus* (*Echocerus*) *maxillosus*, F. Sorghum and millet were attacked by *Chilo simplex*, Butl., *Melanitis ismene*, Cr., *Diacrisia obliqua*, Wlk., *Amsacta lactinea*, Cr., *Cirphis unipuncta*, Haw., *Mocis* (*Chalciope*) *frugalis*, F., *Marasmia trapezalis*, Gn., *Chloridea obsoleta*, F., and *Leptocorisa varicornis*, F.

Bananas are seriously damaged by the larvae of the large skipper, *Erionota thrax*, L., which destroy the leaves, and also by *Setora nitens*, Wlk. (LIMACODIDAE).

Citrus trees are attacked by several species of *Papilio*, including *P. demoleus*, L., *P. polytes*, L. and *P. memnon*, L., the larvae of which eat the leaves ; *Ophideres fullonica*, L., damages the fruits.

Sugar-cane suffers from the attacks of *Sesamia inferens*, Wlk., *Scirpophaga auriflua*, Z., (which lives in and pupates in the stem), *Diatraea saccharalis*, F., *Chilo simplex*, Butl., (the larva of which attacks especially the young shoots, and against which sowing maize between the canes is suggested), *Melanitis ismene*, Cr., *Discophora celinde*, Stoll, *Parnara mathias*, F., *Padraona dara*, Koll., *Telicota augias*, L., *Diacrisia strigatula*, Wlk., *Cirphis loreyi*, Dup., *C. unipuncta*, Haw., *Prodenia litura*, F., *Spodoptera pecten*, Gn., *Mocis* (*Chalciope*) *frugalis*, F., *Mocis* (*Chalciope*) *undata*, F., *Laelia suffusa*, Wlk., *Aroa socrus*, Hb., *Dasychira securis*, Hb., *Leucophlebia lineata*, Westw., *Dinara* (*Antycira*) *combusta*, Wlk., *Marasmia trapezalis*, Gn., *Pyrausta coclesalis*, Wlk., and various unidentified Melolonthid larvae, which attack the roots and do considerable damage.

Coffee is attacked by the following Lepidoptera :—*Acraea* (*Pareba*) *vesta*, F., *Terastia meticulosalis*, Gn., *Creatonotus gangis*, L., *Diacrisia strigatula*, Wlk., *Porthesia virguncula*, Wlk., *Orgyia postica*, Wlk., *Dasychira mendosa*, Hb., *Cephonodes hylas*, L., *Hyposidra talaca*, Wlk., *H. infixaria*, Wlk., *Clania variegata*, Snell., *Setora nitens*, Wlk., *Thosea sinensis*, Wlk., and *Parasa lepida*, Cr. Beetle coffee-pests include *Xylotrechus quadripes*, Chevr., which is dealt with at some length, *Xystrocera festiva*, Thoms., and *Xyleborus coffeae*, Wurth.

Tea is attacked by *Zeuzera coffeae*, Nietn., *Agrotis ypsilon*, Rott., *Prodenia litura*, F., *Orgyia postica*, Wlk., *Dasychira mendosa*, Hb., *D. horsfieldi*, Saund., *Dasychira securis*, Hb., *Hypsa caricae*, F. (*alciphron*, Cr.), *Buzura* (*Biston*) *suppressaria*, Gn., *Ectropis* (*Boarmia*) *bhurmitra*, Wlk., *Attacus atlas*, L., *Clania variegata*, Snell., *Oeceticoides* (*Acanthopsyche*) *bipars*, Wlk., *Suana concolor*, Wlk., *Trabala vishnu*, Lef., *Thosea sinensis*, Wlk., and *Parasa lepida*, Cr.

Coconut-palms are attacked by *Discophora celinde*, Stoll, the skippers *Erionota thrax*, L., and *Gangara thyrsis*, F., *Oryctes rhinoceros*, L., the life-history of which is discussed at length, and *Xylotrupes gideon*, L.

Tobacco is attacked by *Chloridea obsoleta*, F., *Euxoa spinifera*, Hb., *Agrotis ypsilon*, Rott., *Prodenia litura*, F., *Spodoptera mauritia*, Bd., *Phytometra* (*Plusia*) *signata*, F., *Phytometra chalcites*, Esp., *Acherontia styx*, Westw., *A. lachesis*, F., *Dysdercus cingulatus*, F. and *Hypomeces squamosus*, F.

Cotton is attacked by *Earias insulana*, Bd., *Earias fabia*, Stoll, *Zeuzera coffeae*, Nietn., *Ergolis ariadne*, L., *Diacrisia obliqua*, Wlk., *Amsacta lactinea*, Cr., *Creatonotus gangis*, L., *Chloridea obsoleta*, F.,

*Cosmophila erosa*, Hb., *Sylepta derogata*, F., and *Glyphodes indica*, Saund. Hevea is attacked by *Orgyia postica*, Wlk., and *Batocera rubra*, L., the larvae of the latter boring galleries in the branches.

The work closes with a review of certain groups of insects which are more or less universal pests, a note on useful insects and a chapter on insecticides which the author says has been for the most part taken from the work of G. Guénaux, "Entomologie et Parasitologie Agricoles."

**Reports on Insects of the Year 1913 in Ontario.**—*Ann. Rep. Entom. Soc. Ontario*, 1913, *Toronto*, xliv, 1914, pp. 15-25, 2 figs.

The following insects of economic importance were reported from various parts of Ontario in 1913. Locusts were abundant, particularly in sandy districts, and much damage was done by *Melanoplus atlantis* and *Camnula pellucida* to oats, barley, timothy, corn, potatoes and beans at Bowesville, near Ottawa. Several reports were received of damage done to tomatoes by the Noctuid, *Papaipema cataphracta*, which bores into the stems; cutting off the portion of the plant containing the caterpillar is the only remedy that can be suggested. Tent caterpillars (*Malacosoma americana* and *M. disstria*) defoliated apple trees, except in a few cases where the trees had been sprayed; the woolly apple aphis (*Schizoneura lanigera*) was conspicuous in some orchards, as was also the codling moth (*Cydia pomonella*). The most destructive insect to forest trees in 1913 was the forest tent-caterpillar, *Malacosoma disstria*, but the damage was not so serious as in 1912. Among garden and greenhouse plants, roses were injured by the caterpillars of the Noctuid moth, *Pyrrhia umbra*, eating into the buds; asters were attacked at their roots by aphids, and in greenhouses the variegated cutworm, *Peridroma margaritosa* var. *saucia*, attacked carnations.

In the Toronto district, roses were attacked by larvae of *Pemphredon* (*Ceratophorus*) *tenax*, and sawflies (*Pontania populi*) attacked poplars. The season favoured the production of aphids, and the American elm was attacked by *Schizoneura americana*, and *S. rileyi* was abundant in cracks and crevices in the bark of the trees.

In the Niagara district, apple maggots (*Rhagoletis pomonella*) were scarce during the year. Apple aphids, *A. pomi*, *Hydaphis* (*Siphocoryne*) *avenae*, *A. sorbi*, and *Schizoneura lanigera*, were common and many cases of dwarfed apples were observed. The green peach-aphis (*Myzus persicae*) was abundant, but was kept in control by parasites and predaceous insects. Woodlice, commonly known as sowbugs in the U.S.A., *Armadillidum vulgare*, *A. quadrifrons*, and *Oniscus asellus*, infested greenhouses, and seedlings of *Asparagus plumosus*, *Primula obconica*, *Petunia*, *Lobelia*, *Solanum capsicum*, and many other plants were badly attacked. Systematic trapping by means of inverted flower-pots containing damp hay reduced their numbers, as did also poisoned bait, made up of 2 parts rye flour, 2 parts sugar and 1 part Paris green. The tarnished plant-bug (*Lygus pratensis*) damaged asters and chrysanthemums, and Easter lilies were attacked by the bulb mite, *Rhizoglyphus hyacinthi*. The corn-root aphis (*A. maidiradicis*) seriously injured cultivated asters; beets were badly damaged by the maggots of the beet leaf-miner (*Pegomyia vicina*). Elms were

infested by *Schizoneura americana.* The Mediterranean flour moth (*Ephestia kuehniella*) continued to be troublesome in stored meal.

CAESAR (L.). **Insects of the Season in Ontario.**—*Ann. Rep. Entom. Soc. Ontario* 1913, *Toronto*, xliv, 1914, pp. 49-53.

The following list is given of insects which have damaged cultivated plants in Ontario in the year 1913:—Orchard insects: codling moth (*Cydia pomonella*) on apples; San José scale (*Aspidiotus pernicosus*); plum curculio (*Conotrachelus nenuphar*) abundant in places, though not so prevalent as usual; the pear psylla (*Psylla pyricola*) was less numerous than usual; peach tree borers (*Aegeria pictipes* and *Sanninoidea exitiosa*). On bush fruits the currant borer (*Aegeria tipuliformis*) was very abundant, also red spider (*Tetranychus bimaculatus*); the raspberry root-borer (*Bembecia marginata*) severely attacked older canes. On vegetables and field crops: the pea aphis (*Macrosiphum pisi*) was not very abundant; cabbage aphis (*Aphis brassicae*); onion maggot, *Hylemyia antiqua* (*Pegomyia ceparum*), badly infested many crops; asparagus beetles (*Crioceris asparagi* and *C. 12-punctata*) widely spread, and in increasing numbers; Hessian fly (*Mayetiola destructor*) caused serious damage to wheat. Forest and shade trees: Spruce gall-lice (*Chermes similis* and *C. abietis*) were unusually scarce; European fruit Lecanium (*Eulecanium corni*) was very abundant on elms in the Niagara district; Terrapin scale (*Eulecanium nigrofasciatum*) was abundant on maple, but heavily parasitised; English walnut scale (*Aspidiotus juglans-regiae*) was common, but under control, as it is much parasitised.

MACGILLIVRAY (A. D.). **The Immature Stages of the Tenthredinoidea.**—*Ann. Rep. Entom. Soc. Ontario*, 1913, *Toronto*, xliv, 1914, pp. 54-75, 1 pl.

In the Tenthredinoidea many phylogenetic relationships may be discovered by a study of the immature stages; the anatomy, colouration, habits, and metamorphosis of the larvae of many members of this family, so important from an economic point of view, are described.

DARNELL-SMITH (G. P.). **Wheat Straw breaking down through "Contortion" or through the attack of Insects.**—*Agric. Gaz. N.S.W., Sydney*, xxv, pt. 5, May 1914, pp. 377-378, 1 fig.

Cases of buckled or twisted straw, which eventually breaks at the weak point in the wind, are usually due to disproportionate growth or to the attacks of insects. Wheat affected in this way was reported in 1900 from Carrathool and Deniliquin and found to be attacked by APHIDIDAE; these insects infested the wheat-stalk when about 6 inches high, sheltered in the enveloping flag and, by sucking the sap on one side, caused the young stem to bend over or twist almost into a knot. Straw affected in 1912–13 did not reveal the presence of Aphids nor of fungus disease; in these cases the damage was reported as due to "contortion," defined as an irregular twisting or bending of the stem, the causes being often some restriction to growth. Unfortunately this abnormal growth, whether due to Aphids or to contortion, does not admit of remedial measures.

FROGGATT (W. W.). **The Peach Tip Moth.**—*Agric. Gaz. N.S.W., Sydney,* xxv, pt. 5, May 1914, pp. 413-414, 3 p.

For some years orchardists in the neighbourhood of Sydney have been troubled with an undetermined pest of peach-trees; early in the season a minute larva burrows into the tips of the shoots, eating its way downward and causing the terminal leaves to die and the injured twig to exude gum; sometimes nearly every shoot is attacked in this way. Later on in the season a large percentage of the fruit is marked with blotches, covered with exuding gum, under which the skin is gnawed through. A few specimens obtained proved to be the larvae of a Tortricid moth, not unlike the well-known codling moth. This pest has also been found to attack several other fruits such as quinces and apples. The eggs are laid on the tips of the peach shoots. Adult caterpillars and the pupae were captured under bandages wound round the trees. Spraying of all peach trees in the early summer, as soon as the first sign of damage is noticed, with arsenate of lead should prove effective.

FRENCH, JUNR. (C.). **Insect Pests of Fruit Trees. No. 1—The Leaf-Case Moth** (*Hyalarcta hubneri*, **Westw.**).—*Jl. Dept. Agric. Victoria, Melbourne,* xii, pt. 5. May 1914, pp. 294-297, 6 figs.

Numerous specimens of the leaf-case moth (*Hyalarcta hubneri*, Westw.) have been received from correspondents who state that it has caused considerable damage to apples, quinces, grapes, etc. The larva usually bites a piece out of one fruit and then passes on to another, until much of the fruit is damaged and useless. They also attack the leaves and young buds. Native plants, such as the tea tree (*Leptospermum*), *Eucalyptus*, and introduced plants, such as pines and *Cupressus*, are also attacked. A closely allied species, the ribbed case or bag moth (*H. nigrescens*), is destructive to *Eucalyptus*, but has not yet damaged fruit trees. This pest is easily controlled with arsenate of lead.

CAMERANO (L.). **Le Riunioni delle Coccinelle.** [The swarming of Coccinellids.]—*Zeits. wissen. Insektenbiol., Berlin,* x, no. 5, 20th May 1914, pp. 187-189.

The author referring to Professor Werner's paper [see this *Review*, Ser. A. i, p. 548] notes that similar swarms, sometimes on a very large scale, of Coccinellids, especially of *C. septempunctata*, have been noted. In 1877, he observed a swarm on Monte Asinara at 3,000 feet above sea-level, and cites a number of observations to the same effect at even greater elevations in the Appenines. In order to ascertain whether this phenomenon recurs regularly in places in which it has once been observed, the author made several journeys into the mountains, but has not been able to confirm previous observations. He found that *C. septempunctata* and allied species swarm on mountain tops, either in stony places devoid of vegetation, where the insects are found under stones or upon them, or on certain species of plants. The time of year when *C. septempunctata* exhibits a tendency to swarm seems to be very variable; in the case of one mountain top

at least, the swarming occurred at considerable distances from any vegetation, and any idea that the insects gathered there in search of food must be abandoned. Nor is swarming likely to be connected with reproduction, or it would probably occur with greater regularity and exhibit a certain periodicity. The author suggests that this phenomenon may be connected with hibernation, or may be an attempt to escape from enemies, or be determined by failure of food supply. On one occasion on an expedition to the Musine he failed to find a single insect in the summer of the same year in the April of which he had observed swarms, and concludes that the swarms are of short duration and that there is probably no one cause for them. Neither is the swarming of Coccinellids on certain plants easily explained, further evidence on these points being much needed. The species which exhibit the habit in the greatest degree are *C. 7-puncata, C. 5-punctata, C. convergens*, and *Adalia 11-notata*.

DAVIDSON (J.). **Ueber die Wirtpflanze von** ***Aphis rumicis*** **L.** [The host plants of *Aphis rumicis* L.]—*Zeits. wissen. Insektenbiol., Berlin*, x, no. 5, 20th May 1914, pp. 189–190.

Experiments were made to discover if possible the host plants of *Aphis rumicis* (*A. euonymi*, F.). The insects were found in large numbers on the spindle tree (*Euonymus europaeus*) in the spring; winged parthenogenetic females were placed on dock (*Rumex sanguineus*), garden-beans, poppy, onion, beetroot, sugar-beet, mangel-wurzel, and turnip. These plants were grown in pots and covered with gauze. The beans were without exception severely attacked; poppies were also attacked; beetroots, sugar-beets and mangel-wurzels were very slightly attacked; a few isolated small colonies were found on the turnips, and none at all on the onions.

A large gauze tent, pitched in the open, was divided into three sections, A, B, and C, between which there was no communication, the ground beneath the tent having been soaked with carbon bisulphide in April. In section A the following plants were growing:—bean, poppy, beetroot, sugar-beet, mangel-wurzel, turnip, dock, watercress and onion; in B, only poppy and bean, and in C, dock and bean. In each section a small spindle tree infested with the Aphids was placed, and the migrations of the winged parthenogenetic females were observed. In C, no results were obtained, the females on the infected *Euonymus* giving rise to very few offspring. In A, the beans suffered the most severely and then the poppies; the females which had migrated to the beans migrated again to the poppies, where they reproduced. The beetroots and sugar-beets were only slightly attacked; a few colonies were observed on mangel-wurzels and several on docks, but none at all on onions, turnips and watercress. In B, the beans were the first to be attacked.

Three spindle trees, all heavily infested with *A. rumicis*, were observed in the garden; later colonies of the Aphids were found on the following plants:—beans, docks, spinach, parsnip, dwarf bean, kidney-bean, beetroot, sugar-beet, mangel-wurzel, peas, thistle, shepherd's purse, watercress, dahlia, nettles, *Atriplex hortense*, and *Chenopodium album*.

SAVTCHENKO (I.). **О борьбѣ съ жучкомъ "скосаремъ" на южнобережскихъ крымскихъ виноградникахъ.** [On the campaign against *Otiorrhynchus* in the vine-stocks of the South Coast of Crimea.]—**«Садоводъ.»** [*Horticulturist*], *Rostov-on-Don*, no. 6, 1914, pp. 470-473.

*Otiorrhynchus* spp. are found in the Crimea and generally in South Russia along the coasts of the Black Sea; the Crimean species is *O. asphaltinus*, Germ., while the commonest species in other parts is *O. turca*. These beetles are as dangerous a pest of vine-stocks as *Phylloxera*, and in some years destroy more than half the vintage. The damage is done in spring, when the vine-buds begin to swell, the beetles piercing the buds and feeding on their contents. Several generations are bred during spring, summer and autumn, and the period when damage is done lasts from the middle of April until the middle of June; later, when the shoots become more woody, the weevils are no longer able to injure them.

*O. asphaltinus* hides during the day and feeds at night, while *O. turca* feeds during the mornings. Against both species the author recommends hand-picking at night and spraying with barium chloride.

Hand-picking can be done only during warm nights, as the beetles do not leave their hiding-places in the earth when it is cold. On warm nights 28 workmen are able to collect from 10,000 to 15,000 beetles, and in this way the upper buds, which are the most fertile, can be saved, as the pests begin their attack on the lower ones.

Spraying must be begun early in spring and continued at short intervals up to the time when the wood of the shoots has hardened. Early in May, a 6 per cent. solution of barium chloride is recommended, increased later to 12 per cent., 1 lb. of potato molasses being added to every 27 gallons. Small holes, filled with flat stones, may also be made underneath the vines, in which the insects hide during the day, and can then be easily collected and destroyed. Smearing the lower portion of the vine-stems with an adhesive is also recommended, although this remedy is too expensive in the case of large vine-stocks. It is also necessary to smear the poles, as otherwise the insects will get from these on to the plants.

HOWARD (L. O.). **Concerning some Aphelininae.**—*Proc. Entom. Soc., Washington*, xvi, no. 2, June 1914, pp. 79-85.

Among the species of APHELININAE of which accounts are given in the present paper the following are of economic importance: *Paraphelinus tomaspidis*, sp. n., reared from the eggs of the leaf-hopper, *Tomaspis varia*, in Trinidad; *Physcus fijiensis* sp. n., from a species of *Aspidiotus* from Fiji; *P. stanfordi* from *Leucaspis kelloggi* at Stanford; and *Azotus chionaspidis*, sp. n., from *Chionaspis difficilis*, from Tokio, Japan.

WALTON (W. R.). **Four New Species of Tachinidae from North America.**—*Proc. Entom. Soc., Washington*, xvi, no. 2, June 1914, pp. 90-95.

The following new species of parasitic TACHINIDAE reared from insects which attack cultivated plants are described: *Linnaemyia fulvicauda*,

bred from *Mocis* (*Remigia*) *repanda*, taken at Aibonito and Rio Piedras, Porto Rico; *Compsilura oppugnator*, from *Cirphis latiuscula*, at Rio Piedras, Porto Rico; and *Polychaetoneura elyi*, from the red-humped apple caterpillar, *Schizura concinna*.

TOROCHTI (J.). **Грозная опасность усиливается.** [The threatening danger grows.]—**« Южное Хозяйство.»** [*Southern Husbandry,*] *Alexandrowsk*, no. 10, 13th June 1914, pp. 365-366.

The author refers to the damage done in the previous year to crops in the government of Ekaterinoslav by the larvae of *Oria* (*Tapinostola*) *musculosa*, Hb. During the harvest, the moths were on the wing in great numbers and oviposited on the stubble and on weeds, and only the heavy rains put an end to their flight. It appears that those fields where the harvest was finished before the rains began are again infested by the caterpillars. Damage was also noticeable in fields where maize was grown the previous year, and evidently oviposition in this case was effected on weeds. Fields ploughed over with Sakk ploughs, with grass-remover attachment, which bury the stubble deep in the soil, were very little damaged by the pests, in marked contrast with adjoining fields, where no such ploughs were used. This, as well as the burning of stubbles, are the principal remedies against these pests.

OL (I. A.). **Отвѣты.** [Replies.]—**« Прогрессинное Садоводство и Огородничеетво.»** —[*Progressive Fruit-Growing and Market-Gardening,*] *St. Petersburg*, no. 22, 14th June 1914, pp. 704, 711-712 and 713.

In reply to queries from subscribers, the author gives the remedies against the sawfly, *Hoplocampa fulvicornis*, Klg., which lives in the larval stage inside plums, feeding first on the kernel and afterwards on the parenchyma. When the immature fruits drop to the earth the larvae leave them and pass into the soil, where they winter. Digging the soil in order to destroy the wintering cocoons, the daily shaking down of the attacked plums and the destruction of fallen fruits are recommended.

Against *Psylla mali*, Först., the destruction of the eggs late in autumn with iron sulphate, spraying the nymphs and larvae in spring with kerosene emulsion, and fumigating against the imago are recommended.

Against *Forficula auricularia*, L., the author recommends various traps in which these insects will hide during the day.

**Распоряженіе о причисленіи Астраханской губ. и Уральской обл. къ благополучнымъ по филоксерѣ мѣсностямъ.** [An Order declaring the Government of Astrachan and the province of Uralsk to be free from Phylloxera.]—**« Извѣстія Глав. Управ. З. и З.»** [*Bulletin of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, no. 22, 14th June 1914, pp. 544.

An Order of the President of the Central Board of Land Administration and Agriculture declares the government of Astrachan and the province of Uralsk to be free from *Phylloxera* and prohibits the

importation of vine-plants, or any parts of them, into these localities from other vine-growing districts of Russia or from abroad.

CRAWFORD (J. C.). **New Parasitic Hymenoptera from British Guiana.**—*Proc. Entom. Soc., Washington*, xvi, no. 2, July 1914, pp. 85-88.

The following new species of Hymenoptera, parasitic on the eggs or larvae of insects attacking cultivated plants in British Guiana, are described: *Prophanurus alecto*, from the eggs of the sugar-cane borer, *Diatraea saccharalis*; *Aphanurus bodkini*, from the eggs of *Empicoris variolosus*, a Pentatomid bug which occurs on the stem of *Hevea*; *Holcencyrtus calypso*, and *Elachertus meridionalis*, from the larvae of the butterfly *Calpodes ethlius*, which attacks arrowroot. *Prophanurus* (*Telenomus*) *minutissimus*, Ashm., was bred from the eggs of *Lycophotia infecta*; when this species was originally described the host was given as *Dactylopius* sp., but this record is probably incorrect, as the species of this group, so far as is known, are egg-parasites.

CHAMPION (G. C.). **Note on** *Mysia oblongo-guttata*, L., **ab.** *nigroguttata*, **Dollm.**—*Entomologists' Monthly Mag., London*, July 1914, p. 176.

In 1912, the author recorded the breeding of *Syrphus torvus*, from larvae found on young pines in the neighbourhood of Woking. The same trees have recently been examined, and amongst the Syrphid larvae and imaginal and larval Coccinellids to be seen attendant upon the numerous Aphids (*Chermes*), three freshly emerged individuals of *Mysia oblongo-guttata*, L., were found, one of which resembled Dollman's figure of ab. *nigroguttata*. These immature examples were kept alive with living *Chermes* for a week, but all died while still immature. Amongst the eight species of Coccinellids seen on these pines, *Exochomus 4-pustulatus* was as common as *Adalia bipunctata*.

V. V. D. **Вопросы и отвѣты.** [Queries and replies.]—**«Хозяйство.»** [*Choziaistvo*], *Kiev*, no. 23, 3rd July 1914. p. 809.

In reply to a subscriber, the author says that the rape sent was attacked by larvae of *Ceuthorrhynchus sulcicollis*, Gyll., which live inside the roots, causing swellings on them. They do not occur inside the stems of rape, as do the larvae of *Psylliodes chrysocephala*, L. Remedies against both pests consist in pulling up the damaged plants with their roots and burning them, and in deep ploughing of the fields after harvesting the rape. Where the field is seriously infested, it is advisable to replough it at once and to sow some other crop.

MACDOUGALL (R. S.). **Insect pests in 1913.**—*Trans. Highland & Agric. Soc. Scotland*, 1914. Reprint, 19 pp., 14 figs.

*Sitotroga cerealella*, the Angoumois grain-moth, was received for identification from a cargo of maize condemned at an English port. The sample, which was very badly infested, also contained many

*Calandra oryzae.* Larvae and pupae of *Cossus cossus* were taken from old larch stools, in which no larval borings could be found, but further examination revealed these in neighbouring broad-leaved trees, which had been left by the mature larvae for pupation. The larvae of *Hepialus humuli* are recorded as damaging oats, potatoes, artichokes, carrots, asparagus and hops. In January, specimens were received which were reported to be destroying a plantation of two-yeard-old ash, eating the plants off at or just below the surface of the ground. Vaporite incorporated with the soil does some good, also trapping with pieces of potato and disturbing the soil as much as possible. *Odontoptera bidentata*, the scalloped hazel moth, which flies in May and June, attacked ivy and rhododendron, but also feeds on many other plants. When seriously infested, plants should be sprayed with arsenate of lead. *Hylastes palliatus*, Gyll., a bark boring beetle, has this year proved destructive to Scots Pine, in company with *Hylurgus* (*Myelophilus*) *piniperda.* The economic importance of *Hylastes* in forests is, in the author's opinion, underestimated. In April, after pairing, the beetles bore into the bark, following the long axis of the tree for about 1½–2 inches. Eggs are deposited along the sides of this gallery and the larvae gnaw out tunnels of their own. Pupation occurs at the end of the gallery. There are two generations in the year, the April brood emerging in the summer, and the second brood wintering in the larval, pupal or imago stage beneath the bark. A series of trap stems from the end of March until October is the best method of keeping down *H. palliatus.* Dying trees should not be allowed to remain in woods except as traps. *Bruchus rufimanus*, (the bean beetle) enters Scotland every year in imported beans. *Bruchus pisorum*, L. (*pisi*) similarly infests the pea. Fumigation with carbon bisulphide is recommended. Against *Schizoneura lanigera*, the woolly apple-aphis, the following soda-emulsion wash is recommended by Pickering : dissolve ½ lb. iron sulphate in 9 gallons of water ; slake ¼ lb. lime in a little water, stir well and add more water ; run this milk of lime into the iron-sulphate solution through a piece of sacking or a fine sieve ; add 5 pints solar distillate paraffin, and water to make 50 gallons, and churn thoroughly ; just before using add 2 lb. caustic soda (powdered). The sprayer's face, eyes and hands should be protected against this wash. In the case of root infestation, fumigation with bisulphide of carbon is recommended, one fluid ounce being injected into the soil in each of four places about two feet from the trunk of the apple-tree. This fluid must not touch the roots, but the vapour will not injure them. *Eriophyes pyri*, the pear-leaf blister-mite hibernates under the bud scales of the shoots of the year, making fresh galls in the spring in which to deposit their eggs. All blistered leaves and shoots should be collected and burnt. In January or February, just before the buds burst, Theobald's formula for lime-sulphur-soda-salt wash should be used : 3–6 lb. quicklime and 1 lb. caustic soda to be mixed and then slaked with hot water in which 3 lb. of sulphur has been mixed ; add 3 lb. salt and water to bring up to 10 gallons ; and this should be followed in spring with a weak paraffin emulsion wash, which may also be used after the leaves have fallen to kill those mites not yet in the shelter of the bud scales. *Eriophyes pyri* also attacks apple, white beam (*Pyrus aria*), wild service tree (*Pyrus terminalis*), rowan, and *Cotoneaster vulgaris. Eriophyes*

*tristriatus* var. *erineum*, blisters the leaves of the walnut tree, while *E. tiliae* var. *leiosoma*, attacks the lime.

Wahl (C. v.) & Müller (K.). **Bericht der Hauptstelle für Pflanzenschutz in Baden an der Grossherzogl. landwirtschaftl. Versuchsanstalt Augustenberg für das Jahr 1913.** [The report of the chief plant-protection station in Baden, at the Augustenberg Agricultural Experiment Institute of the Grand Duchy for 1913.] *Stuttgart*, 1914, 70 pp. [Received 19th June 1914.]

*Eriophyes vitis* was reported to be common on vines in many localities, but *Phyllocoptes vitis* was not noticed, not even at Wollbach, where infestation had been particularly severe during the last few years. *Phylloxera vastatrix* was observed near Efringen in August, and more than 25,000 stocks were destroyed. Caterpillars of what appeared to be a species of *Agrotis* damaged the vine-shoots. *Sparganothis* (*Tortrix*) *pilleriana* was uncommon. Though the vine moth, (*Clysia ambiguella*, Hb.) has remained in abeyance, control measures must not be omitted in 1914. Efficient results are obtained by thorough spraying with nicotin, applied at the right moment. *Polychrosis botrana* has diminished in Baden, as in other parts of Germany. In the island of Reichenau 61,037 were caught on sticky racquets between the 14th and 20th May. Later, cold weather stopped the flight and few captures were made. The first generation was not generally combated. At the Kaiserstuhl the moths of the second generation were on the wing from the 5th to the 25th of July, the period of greatest intensity being from the 10th to the 19th. In one case good results were obtained with a spray containing 11 lb. of Muth's compound, $8\frac{3}{4}$ lb. nicotin and $8\frac{3}{4}$ lb. soft soap. This quantity was applied to a vineyard of $1\frac{1}{4}$ acres in which each stock had from 6 to 15 bunches. Spraying 4,000 stocks with 700 pints of nicotin at Ringelbach on the 22nd July also had good results as compared with untreated vineyards. Apples were everywhere attacked by *Anthonomus pomorum*, against which sticky-bands and corrugated paper traps were useful. Many *Phyllobius oblongus* were noticed, and in Bohlsbach *P. piri* and *P. argentatus* defoliated the fruit trees. Bark-beetles were more or less numerous, apples and the German prune being the most severely attacked.

*Scolytus rugulosus* and *S. pruni* were very common. Infested trees should be burned, as it was found that the removal and burning of the bark is not sufficient to destroy these beetles. *Cheimatobia brumata* did more damage in 1913 than for many years past. On the lake of Constance and in the Mosbach district the trees were often completely defoliated, apple-trees suffering most. This severe infestation was partly due to the early flight in the autumn of 1912 and the tardy and only partial application of sticky bands. In orchards in which banding has been regularly carried out and was effected in good time in 1912, no damage was done. In dealing with the caterpillars, banding is to be preferred to spraying with arsenicals. *Hyponomeuta malinellus* was noticeable everywhere and towards the end of May apple-trees were covered with nests, both leaves and young fruit being destroyed. Torches were used, but great care is necessary, as nest-destruction effected by this method in 1892 lowered the bearing

capacity of the trees in 1893 and untreated trees gave a better crop in spite of much leaf injury by the caterpillars. *Clisiocampa* (*Bombyx*) *neustria* and *Euproctis* (*Porthesia*) *chrysorrhoea* were noticed. *Cydia* (*Carpocapsa*) *pomonella* and *C. funebrana* did much damage and the fruits which survived the frosts were severely attacked. Band-traps were of great use. In the Heidelberg district, £1,100 worth of corrugated millboard bands were purchased, half the cost of which was defrayed by district funds. *Cossus cossus* appeared in the flat lands on the Rhine and bisulphide of carbon was used to control it. *Lyonetia clerkella*, which was scarcely to be found after the hot summer of 1911, reappeared in numbers and the second generation in autumn was particularly evident on apple-trees and cherries.

*Aphis mali* was favoured by the warm dry weather prevalent from mid-May to mid-June. Solutions of soft soap and nicotin or quassia were efficacious where the leaves had not curled too much. Dipping the shoots of young seedlings is specially recommended. *Schizoneura lanigera* was widely distributed and, contrary to a statement in the report for 1912, advices from Ludwigshafen say that there the varieties of apples known as Baumann's rennet and Canada rennet are non-resistant. *Aspidiotus ostreaeformis* and *Lepidosaphes ulmi* (*Mytilaspis pomorum*) were found everywhere. Painting with fruit-tree carbolineum has proved successful. Very good results were obtained with a 23–30 per cent. solution applied to the trunks, whilst particularly badly infested trees were also sprayed with a 10–15 per cent. solution. Carbolineum is increasing in favour, partly owing to the fact that some makers are delivering a product of good, regular quality. Tests must always be made before use. *Phytoptus piri* occurred in some numbers and *Hyponomeuta padellus* and *H. malinellus* infested prunes and plums. Though so injurious some years ago, *Hoplocampa fulvicornis* again remained in abeyance. The following aphids occurred: *Myzus cerasi*, on the cherry; *Phorodon humuli* and *Hyalopterus pruni*, on prunes and plums; *Aphis persicae*, on apricots and peaches.

*Abraxas grossulariata* and *Nematus* were comparatively scarce on bush-fruits, and were effectively controlled with tobacco dust and basic slag. *Myzus ribis* occurred on the red currant, and *Rhopalosiphum lactucae* on the leaves of the black currant, while *Aphis grossulariae*, Kalt., attacked the shoots. *Schizoneura grossulariae*, Schüle (*S. fodiens*, Bkt., *S. ulmi*) was found at the roots of currant bushes.

*Trachea* (*Hadena*) *basilinea*, F., caused damage to grain crops, whilst a field of barley was nearly destroyed near Mosbach by a species of *Tipula*. *Oscinis frit* did not appear in many localities where it occurred last year. Some loss was occasioned by the reddish larvae of *Clinodiplosis equestris*. *Cephus pygmaeus* appeared on rye; *Tarsonemus spirifex* was less noticeable than before.

Fodder and sugar-beet were injured by *Silpha atrata*, against which treatment of the seed with formalin and the use of gypsum were tried, but not found practically useful. *Anthomyia conformis* damaged from 10 to 40 per cent. of the plants at Scheckenbronnerhof, whilst *Aphis papaveris* occurred in many fields.

Red clover and sainfoin were infested by larvae, probably those of the clover root-beetle; vetches and peas were attacked by *Sitones lineata*; *Anisoplia agricola*, Goeze (*villosa*), appeared in numbers on maize at Gremhof, but no apparent damage resulted; turnips were

severely infested by the larvae of *Psylliodes chrysocephala*, L.; *Phorodon humuli* was controlled with applications of nicotin and soft soap and of quassia and soft soap. *Meligethes aeneus*, was noticed on kohlrabi and rape. *Crioceris asparagi* was somewhat numerous in asparagus beds near Karlsruhe.

*Hylobius abietis* injured Weymouth pines; *Ips* (*Tomicus*) *typographus* attacked firs; *Cryphalus piceae* injured plantations of *Abies orientalis*; *Nematus* (*Pontania*) *vesicator* attacked osiers; *Gracillaria complanella* occurred on oaks, and maple leaves were attacked by *Eriophyes macro rhynchus*. *Chermes piceae*, *Coleophora laricella* and *Aphis rosae* also occurred.

Jacques (N.). **La défense de nos arbres fruitiers.** [The protection of our fruit trees.]—*Moniteur hortic. belge, Brussels*, xx, no. 1, 5th Jan. 1914, pp. 868-9.

The woolly aphis is best controlled by applying pure carbolineum with a brush to the trunk and branches about the 20th of January; a few days later the whole tree should be sprayed with a 15 per cent. solution of the insecticide, followed by a second spraying in May with a 2 per cent. solution. To destroy the pest on the larger roots, they must be uncovered and boiling water poured on them. Scraping, followed by painting with milk of lime with 5 per cent. of sulphate of iron added, is the method advised against *Anthonomus*; infested buds must be cut off and burned. The eggs of *Clisiocampa* (*Bombyx*) *neustria* may be destroyed in the same way. "Sticky bands" are efficacious against *Cheimatobia* and shelter-traps against its caterpillars. The eggs of peach, apple and other aphids may be destroyed by the application with a brush of the following mixture: Milk of lime, $4\frac{1}{2}$ gals.; sulphur, 35 oz.; petroleum, 35 oz.

Kartzov (A. S.). **I. Культура гороха и фасоли. II. Какъ выращивается салатъ.** [I. The cultivation of peas and French beans II. How to grow salad.]—**«Огородная библiотека.»** [Market-Gardening Library, vols. 3 & 4.] Supplement to **«Прогрессивное садоводство и огородничество.»** [*Progressive Fruit-Growing and Market-Gardening.*] *St. Petersburg*, 1914, 35 pp. 14 figs.

In this booklet the author deals with some of the pests of peas, beans and salads. Peas are subjected principally to attack by various Bruchidae, amongst which *Bruchus pisorum* (*pisi*) is specially mentioned. The females oviposit on the ovaries and the larvae live inside and feed on the seeds, the adults remaining in the seeds through the winter. As remedies the author suggests the heating of the infested seeds to a temperature of 122° F. for not more than two minutes; the use of carbon bisulphide; late sowing of peas, so that the beetles should have left them before sowing; trap crops sown from 10 to 14 days previously, on which the beetles will oviposit, the plants being afterwards used as food for domestic animals; heating the seeds in winter to a temperature of 68° F., which will cause the beetles to come out of them; moistening the seeds with lime-water

a few days before sowing and the watering of the beds with the same water mixed with soot. Kidney and French beans are attacked by *Tetranychus telarius*, L., and *Aphis radicans*; spraying with 1 per cent. solution of saltpetre in water at a moderate temperature is recommended against the former, whilst a 1 per cent. solution of tobacco-extract is useful against the latter.

Various salad plants are attacked by insects, amongst which the author mentions *Barathra* (*Mamestra*) *brassicae*, *Euxoa* (*Agrotis*) *segetum*, *Agriotes lineatus* and *Melolontha melolontha*.

Portchinsky (I. A.). **Важнѣйшіе клещи, встрѣчаемые въ зернѣ и мукѣ и нѣкоторыя данныя для обнаруженія вредныхъ насѣкомыхъ въ хлѣбныхъ запасахъ.** [The principal mites found in grain and flour and some information for the discovery of injurious insects in grain stores.]—**« Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture.*] *St. Petersburg*, xi, no. 2, 1914, 52 pp., 32 figs.

*Pediculoides ventricosus*, Newp., has been known for many years in France, Italy, Austria-Hungary and other countries as occasionally causing dermatitis in man, especially to those engaged in carrying bags of grain. Both sexes are described; the female is viviparous, being able to give birth during a single day to about 50 individuals, which are themselves able to reproduce descendants in about six days after birth, at a temperature of 88°–108° F., multiplication ceasing at a temperature lower than 50° F. The larvae of *Sitotroga cerealella*, and of various species of *Isosoma* are attacked by *P. ventricosus*. In the case of the former, the mites in the form of young migratory females get into the grain through the minute opening made by the young larvae of the host and on such larvae the females and their descendants feed. Chalcids of the genus *Isosoma*, which dwell in the stalks, are also attacked by the nomadic females of the mites either after the harvest, when the stalks are opened in the internodes, or in spring, when the young *Isosoma* gnaw openings in the stalk, through which the mites gain access to them. Together with the stalks and straw the mites get into mattresses and beds and attack man, causing a dermatitis which is described, with figures. These mites also attack *Ditropinotus aureoviridis*, Crawf., a parasite of *Isosoma*.

*Trombidium* (*Microtrombidium*) *pusillum*, Herm., known under the popular name of "rouget" in France, and "harvest mites" in America and England, was usually, until lately, mistaken for *Pediculoides ventricosus*. The larvae which attack men and animals were previously considered to be a distinct species and were called *Leptus autumnalis*. The author describes the adult mites and their larvae, figuring both stages, and points out that, while the adults of *Trombidium* are exclusively phytophagous, their larvae attack either various insects, or, as is the case with *T. pusillum*, the higher animals. They occur commonly on fowls, frequently causing death, and in Denmark a yearly epidemic disease of man called "August Knuder" is due to them. The eggs of *Trombidium* are laid in the earth and

the larvae hatch in the second half of summer; they are nomadic and are found in July, August and September in large numbers on the surface of the earth, on certain plants, stalks of grain, in wood, etc., from which they pass as soon as occasion offers to the bodies of men; the method of attack is described and several cases are cited; the larvae having sucked sufficient blood, drop off their victims, moult, pass into the nymphal stage and produce the adult mite, which winters and proceeds to multiply in the following year. The eggs laid by one female number sometimes 400. These mites are less connected with grain crops, living on the latter only occasionally; their usual abodes are gardens, market-gardens, stalls and similar buildings.

*Tyroglyphus* (*Aleurobius*) *farinae*, Koch, is the most important species of mite found in grain and flour, doing the greatest damage to the latter in the presence of moisture and warmth, and is often carried with cargoes of grain to other countries. In France, this mite prefers barley to all other grain. It breeds in wet or musty flour, such as is often used for paste, and is consequently often found underneath wall paper, in factories where such paste is used and in cheese.

*Tyroglyphus siro*, L., is found principally in many sorts of cheese, but also occurs on many other objects, such as flour, dust, hair used for stuffing furniture, hay, etc., and together with *Tyroglyphus longior*, Gerv., is responsible for a disease called "vanillism," described by Layet, which is common among workmen engaged in cleaning vanilla. *Tyroglyphus longior*, Gerv., is more active than *T. siro* and is found on various articles of animal or vegetable origin.

The author describes the hypopial or migratory nymph of the above three species of *Tyroglyphus*, in which stage some individuals of the mites survive unfavourable periods, when the absence of food leads to the death of the adults and larvae. In order to discover the presence of mites in flour, the author suggests, in addition to the usual microscopical examination, the two following methods. A glass full of flour is exposed to direct light and the presence of mites will be demonstrated by sinuous lines, marking the paths of those which are trying to evade the light, or the flour may be arranged in small heaps, and the movements of the mites will soon bring about some change in the forms of them. Mites cannot live and breed in dry grain or flour; they can be destroyed by the vapour of napthaline in from 9 to 20 hours; the same results can also be obtained with carbon bisulphide or by a temperature of 135° F. *Pediculoides ventricosus* can only be successfully destroyed together with the larvae of those insects on which it breeds.

The last chapter of this book is devoted to the means of discovering various injurious insects in grain stores. In such cases it is advisable to examine the waste found in the grain, such as parts of the bodies of the pests, larval skins, and the excrement of various insects, and although these studies are not yet concluded, the author thinks that such observations may prove very useful in identifying the exact pests. He describes and figures the excrement of *Bruchus pisi*, *Dermestes lardarius*, *Tenebrio molitor*, *Trachea* (*Hadena*) *basilinea*, *Sitotroga cerealella*, *Calandra granaria*, *Sitodrepa* (*Anobium*) *panicea*, and *Tenebroides mauritanicus*, and gives details which allow of distinguishing between eleven species of pests according to their excreta.

VALCH (B. S.). **Капустная совка въ Волчанскомъ уѣздѣ въ 1913 году.** [*Barathra brassicae* in the district of Voltchansk in 1913.] **« Бюллетень о вредителяхъ сельскаго хозяйства и мѣрахъ борьбы съ ними.** [*Bulletin on pests of Agriculture and methods of fighting them.*] Published by the Entomological and Phytopatological Bureau of the Zemstvo of the Govt. of Charkov. *Charkov*, no. 2, March 1914, pp. 29-33.

Regarding the outbreak of *Barathra* (*Mamestra*) *brassicae*, which took place in the district of Voltchansk (government of Charkov) in August 1913 (see this *Review*, A, i, p. 500) and in view of the possibilities of a new outbreak in 1914, the author paid another visit to the threatened area in September last. The results of his digging operations, conducted in several parts of the district, showed that no caterpillars were present, all having pupated; the pupae were mature, but no signs of the beginning of the development of the imago could be observed. Larvae and pupae of *Calosoma denticolle* were also found. He estimates that the average number of caterpillars before pupation on 49 square feet must have been about 200, and but for the favourable weather, which allowed the plants to recover, this number would have been sufficient to destroy the beet-crops entirely. He could not establish precisely the percentage of caterpillars destroyed by fungus diseases and parasites, but thinks that these factors play a very important part in checking the spread of the pest. The number of pupae showed a decline in comparison with that found by him during his visit to the district in the previous August, which is attributed to the influence of birds, principally rooks, starlings, and plovers (*Vanellus cristatus*, Mejer) as well as to the disturbance of the soil connected with the beet-harvest. In many localities harrowing the soil was carried out, which also served to destroy the pupae. The author concludes that a serious outbreak of the pest is not to be expected on the beet-plantations, but he points out that these insects can also breed on weeds, etc., and recommends therefore the following remedies :—Harrowing the soil in autumn or early in spring; deep ploughing of areas covered with weeds, if necessary; the keeping clean from weeds of the grain fields adjoining beet plantations; keeping a careful watch on the state and numbers of wintering pupae in spring; the use of trap crops to control oviposition, etc.; spraying the fields attacked with Paris green, barium chloride, etc.

ALFIERI (A.). **Un Hyménoptère parasite des oothèques d'un Blattide. Un Hyménoptère parasite des chenilles de *Trichophaga swinhoei*, Butl.** [A Hymenopteron parasitising the oothecae of a Blattid. A Hymenopteron parasitising the caterpillars of *Trichophaga swinhoei*, Butl.]—*Bull. Soc. Entom. d'Egypte, Cairo*, vi, no. 1, Jan.-March 1913, pp. 14-15. [Received 30th June 1914.]

From two Blattid oothecae which the author was keeping for the purpose of observing the young Blattids, probably of *Stylopyga orientalis*, L., two species of *Evania*, *E. laevigata*, Latr. and *E. abyssinica*, West, were obtained.

Caterpillars of *Trichophaga swinhoei*, Butl., were found by the author towards the end of May 1911 in jackal excreta at Helmieh, which

produced three moths and one hymenopterous parasite. The author has also obtained this parasite from a caterpillar different from the above, but the imago of which is unknown.

(A. F.). **Les Tenthrèdes du Poirier.** [The Tenthredinidae of the pear.] —*Moniteur hortic. belge, Brussels*, xx, no. 6, 20th March 1914, p. 932.

Control must be directed against the larvae and a high-pressure spray is necessary. "Phytophiline" No. 1 in a 1 per cent. solution is effective and may also be used against the larvae of *Pamphilius (Lyda) nemoralis*.

Willcocks (F. C.). **Notes on some Injurious and Beneficial mites found in Egypt.**—*Bull. Soc. Entom. d'Egypte, Cairo*, vi, no. 1, Jan.-March 1913, pp. 15-18. [Received 30th June 1914.]

During the summer of 1912 a species of *Bryobia* was present in enormous numbers on the lebbek trees in and near Cairo and at Helwan, attacking almost every leaf and imparting a bleached or dusty appearance to the trees. The author first noticed this *Bryobia* in 1911, on a small tree at Ghezireh. It may be identical with the "red spider" mentioned in 1904 by Draper as very common in Upper Egypt on lebbek trees in 1903. What is believed to be the same species also occurs on citrus trees, plum and castor oil plants, poplar trees, and convolvulus. The common red spider or spinning mite, *Tetranychus telarius*, L., frequently injures plants in Egypt. Two mites belonging to the genus *Tenuipalpus* occur on pomegranate and privet. The species on pomegranate is related to *T. palmatus*. Another species of a bright scarlet colour and related to *Tenuipalpus pulcher*, Can. and Fanz., lives in small circular pustules which it forms on the bark of the trunk and branches of the "sunt" tree (*Acacia arabica*). Five species of gall-forming mites (Eriophyidae) occur in Egypt, one on each of the following host-plants: *Acacia arabica*, sycamore fig, *Vitex agnus castus*, tamarisk, and vine. *Hypopus spinitarsus*, Herm., has been found in numbers on imported hyacinth bulbs and also on onions believed to have been grown in Egypt. Enormous numbers of *Pediculoides ventricosus*, Newp., a beneficial mite of wide distribution, were bred from cowpeas infested with *Bruchus chinensis*, the cowpea beetle. The mites had destroyed the larvae and pupae of the latter in large numbers. The author also found this same mite feeding on the pupa of a Buprestid beetle on a fig-tree at Zagazig, and it has been observed in the laboratory on the larvae of *Earias insulana*, and on the pupae of *Prodenia litura*.

Gough (L. H.). **A new Cotton Insect.**—*Bull. Soc. Entom. d'Egypte, Cairo*, vi, no. 1, Jan.-March 1913, pp. 19-20. [Received 30th June 1914.]

From cotton-bolls received from Belcas and Dessouk large numbers of a small moth emerged at the end of November and the first week of December (1912), and have been identified as *Cryptoblabes gnidiella*, Mill. (Pyralidae), which does not appear to have been recorded from Egypt before. The numbers obtained were too great

for the insect to have been merely chance inclusions, and the larvae must either have fed inside the bolls or on the involucres; the latter being more probable, as according to Spuler this insect is said to feed on the leaves of *Daphne gnidium*, *Tamarix*, *Citrus*, *Mespilus*, and vines.

Willcocks (F. C.). **The Date-Stone Beetle.**—*Bull. Soc. Entom. d'Egypte, Cairo*, vi, no. 1, Jan.-March 1914, pp. 37-39. [Received 30th June 1914.]

The author found a small Scolytid beetle, thought to be *Coccotrypes dactyliperda*, in the stones of "Amry" and "Aglawy" dates from Sharkia Province. An infested stone is perforated by a small circular hole and a quantity of pale-coloured dust, composed of excrement and matter excavated from the stone, may be observed inside the date itself. The hole leads to a chamber of irregular shape and varying dimensions, which may be full of these beetles, pupae, larvae and ova, crowded together. One date-stone was found to contain 9 beetles, 6 pupae and 24 larvae of different sizes, besides ova. Of 244 stones from the "Amry" dates only 3, or 1·4 per cent., harboured the beetle, while of the 398 "Aglawy" date-stones examined 47, or 11·8 per cent., were infested.

Jepson (F. P.). **A Mission to Java in Quest of Natural Enemies for a Coleopterous Pest of Bananas.**—*Fiji Dept. Agric., Suva, Bull.* no. 7, 1914, 18 pp., 3 pls.

The most serious of the banana pests in Fiji is the so-called banana borer, the weevil, *Cosmopolites sordidus*, Germ. In a badly-infested district as many as 100,000 individuals were collected in a single month on one plantation, and comparatively free districts were rapidly becoming more infested (1912). The pest was introduced about 1901 and attacks all varieties of cultivated bananas. It has a very wide distribution in the Far East, and also occurs in Brazil and the West Indies, but its original habitat is unknown, or its natural enemies might be located. Enemies occur in Java and Dutch Borneo in the form of predaceous beetle larvae. Young suckers attacked by the borer wither and die in a very short time. The first indication of attack is the death of the "pipe," *i.e.*, the roll of unopened leaves at the heart of the plant. The root upon examination is found to be riddled by the larvae and when cut open they are seen *in situ*. The plants attacked at a later stage in their growth are often capable of producing a good crop, the presence of the borer not then seeming to affect them. The adult weevils abound in the soil about the roots and take shelter under loose fibre surrounding the base of the stem.

The eggs are deposited singly upon the base of the banana stem near the "crown," generally a few inches above the surface, less often on the bulb beneath the soil. The small larva works its way inwards and downwards into the bulb. The burrow widens as the larva progresses and terminates in a pouch near the outer surface in which the larva pupates. No cocoon is made; the larval period extends over about twenty days; after a pupal period of from six to eight days the adults emerge from the bulb, remain in the soil for a short time,

and then come to the surface to oviposit. The insects probably breed all the year round. In the laboratory the adults have been kept alive in moist earth for fourteen weeks. Of six specimens obtained from pupae and fed upon pieces of banana root, four lived for over 16 weeks.

As it was considered impossible to control the pest by artificial means the author was sent in search of a natural enemy, and he proceeded to Java, where several insects were found preying in varying degrees upon *Cosmopolites sordidus*. Of these the most effective was the Histerid beetle, *Plaesius javanus*, Er. The adult of this beetle consumed in captivity eight fully-grown grubs of the banana borer per diem, while its larva demolished no less than 33 or more grubs per diem. Five thousand of these beetles were transported in moist earth without food from Java to Fiji, a voyage of about five weeks. Of this number about 1,200 perished *en route*, chiefly it is believed owing to cold weather experienced on the coast of Queensland. Three thousand five hundred beetles were distributed in lots of 500 upon seven different plantations in badly-infested banana districts, the remainder being retained for observation. Beetles sent from Java to Fiji by post, packed in damp moss, reached the latter place alive. A further supply is therefore obtainable. Visits to plantations show that the beetles are alive and reproducing, after a period of four months in the country, which points to their probably being established. Their distribution is therefore only a matter of time and good results are anticipated from them.

WILLCOCKS (F. C.). **Note préliminaire sur *Bracon* sp., insecte parasite du Ver de la Capsule du Cotonnier.** [Preliminary note on *Bracon* sp., an insect parasite of the Cotton Boll Worm.]—*Bull. Soc. Entom. d'Egypte, Cairo*, April-June 1913, no. 2, 1914, pp. 56-67.

The identity of the Braconid which is parasitic on the cotton boll worm (*Earias insulana*, Boisd.) has been a matter of doubt; it is related to *Bracon variegator*, and resembles also the recently described *Rhogas kitcheneri* and is very probably identical with it. In Egypt its distribution is very wide, and it occurs practically everywhere where cotton is cultivated. In the field it is recognised as a parasite of the boll worm, but laboratory experiments have shown that it can breed equally well on the pink boll worm (*Gelechia gossypiella*).

The female attacks the boll worm from the time when the latter is half-grown until it is fully developed. When attacked, the host is not quite killed, but is rendered incapable of movement; the eggs are laid in it in batches of 2 to 7 and the larvae hatch within 3–5 days. The larva develops for 6–10 days at the expense of the host; normally it is colourless, but if the pink boll worm has been the host, the larva is red with white markings. The larva then leaves its host, and pupates in a white cocoon. In December, the whole life-cycle lasts from 20 to 36 days, while eggs laid at the end of December or during January take about 63 days to reach maturity. In the laboratory a single female would attack several individuals of the host without laying eggs, but the result was always to paralyse the individual attacked, an effect probably due to a poison injected by the ovipositor affecting the nervous system; the paralysed individual lives for about 17 days.

The degree of efficiency of this Braconid in controlling *Earias* is uncertain ; in 1911, at Bahtin, it was found that 44 per cent. of the boll worms were destroyed. It is thought that, although a very useful asset in keeping the boll worm in check, the Braconid cannot perform the entire work of control.

WILLCOCKS (F. C.). **An Acarine Parasite of the Pink Boll Worm.**—*Bull. Soc. Entom. d'Egypte, Cairo,* April-June 1913, no. 2, 1914, pp. 68-72.

The pink boll worm is the larva of a small Tineid moth, *Gelechia gossypiella* ; it has been recorded as attacking cotton in various parts of Egypt, and has become a serious pest during the past few years. Recently the predaceous acarine, *Pediculoides ventricosus*, has been found to be quite common on pink boll worms infesting a sample of cotton seed from Behera province. At first it was thought that the mite might be an important enemy of *G. gossypiella*, but is now doubtful whether this is the case. To be effective, it must be able to attack the pest in the field, but its powers of doing this, judging by its effect on the Mexican boll weevil in America, are likely to be very limited ; and it is improbable that it will prove an important enemy of the pink boll worm in cotton seed, since to increase rapidly it requires a fairly high temperature, which is not reached until all the seed has been sown. The life-history of the mite is as follows: It is viviparous, the males and females becoming sexually mature within the body of the parent and mating soon after they are born; under favourable conditions there may be a generation every four days. The attachment of the young mites results in the death of the pink boll worm, as they extract all its fluid contents.

These mites also attack man, giving rise to an eruption of the skin.

BARSACQ (T. P.). **Destruction of Locusts in Turkestan.**—*Mthly. Bull. Agric. Intell. Plant. Dis., Rome,* v, no. 4. Apr. 1914, pp. 558-564.

Turkestan being still without transit, is self-dependent in the matter of cereals, consequently protection from the attacks of locusts is most necessary. A number of species occur, some being less harmful than others. The Morocco locust (*Stauronotus maroccanus*), which is very destructive, deposits its eggs on arid uncultivated plains, the permanent area of distribution being the steppes of Samarkhand, the Khanat of Bokhara and Afghanistan. Temporary egg deposition centres are sometimes found in Turkestan. This locust has been found to select altitudes up to 6,600 feet above sea-level for oviposition, and the density of the eggs may reach 10,000 clusters per square yard, the whole centre occupying some hundreds of acres. The hatching period lasts 7–10 days, usually between the 2nd and 10th of April. The migratory locust, *Locusta* (*Pachytylus*) *migratoria*, has many permanent areas of distribution in Central Asia, such as reed-beds on banks and in deltas of the rivers. Though usually preferring the shoots of reeds, this species, perhaps mixed with *L. danica*, is reported in 1896 as having damaged 75,000 acres of various crops. Recently no serious damage done by it has been reported. The Italian locust, *Caloptenus italicus*, though common in Turkestan, has only recently

been found to be of economic importance. It is thought that this was due to its having been starved out by the more voracious Morocco locust; as in districts where the latter was exterminated a few years ago, *Caloptenus* is now found in far larger numbers than formerly. The following locusts are also known as of minor economic importance in Turkestan: *Oedaleus nigrofasciatus*, Deg., *Arcyptera flavicosta*, Fisch., *Arcyptera* (*pallasiella*, Kirby) *turcomana*, Fisch.-Waldh., *Acridium aegyptium*, L., *Stauronotus kraussi*, *S. tartarus*, *S. anatolicus*, and *S. brevicollis*. Several well-known means of destroying the different stages of locusts are given [see this *Review*, Ser. A, ii, pp. 37–39]. Scorching the larvae by using a special knapsack apparatus (Schkilin's was found the best) and the petroleum flare is efficient but expensive, and only advisable on rough ground free from grass. A table is given showing the area chemically treated at the expense of the State, and in 1911, 196,000 acres were treated with 286,000 lb. of Paris green, 404 large machines being used. Sodium arsenite was used in Turkestan in 1911 and, the results being excellent, it is now the only chemical used on a large scale. The strengths recommended for the various stages of the larvae are: 1st and 2nd stages, 0·25 per cent.; 3rd stage, 0·37–0·4 per cent.; 4th stage, 0·5 per cent.; adhesiveness is obtained by adding double the amount of molasses in each case. Hopper-dozers are recommended for small infestations of locusts on level ground free from vegetation. The preparation during summer and autumn of forecast maps, showing the position, area, and degree of parasitisation of the egg-centres in the different districts, is advised. These centres should be examined in spring, as in many cases it will be found that various natural enemies have so reduced the egg-clusters that treatment will not be required. The chief enemies of the Morocco locust in Turkestan are the Bombyliid flies, *Callostoma desertorum* and *Cytherea* (*Mulio*) *obscura*, F., the larvae of which together account for about 40 per cent. of the eggs, while those of *Mylabris 4-punctata* destroy hardly 2 per cent. Predatory enemies of locusts are scarce in Turkestan; some species of *Callistenes* eat the larvae and *Prosodes*, *Adesmia*, *Stalagmoptera* and certain Elaterids (? *Athous*), eat the egg-clusters. The fungi which attack these eggs are as yet little known, but they are evidently spread by birds, and sometimes entirely destroy egg-centres. The rose-coloured starling (*Pastor roseus*) and sparrows feed on the larvae, while ravens and crows chiefly take the eggs, as also do lizards of the genera *Eremias* and *Phrynocephalus*. Infecting the locusts with *Coccobacillus acridiorum*, d'Hér., is being attempted, and may give good results. A table is given of the losses in Turkestan caused by this insect, the money spent by the Locust Control Administration, and the results obtained.

PATCH (E. M.). **Currant and Gooseberry Aphids in Maine.**—*Maine Agric. Expt. Sta., Orono*, Bull. 225, Feb. (issued 14th April) 1914, pp. 49-68, 15 figs.

The author deals with several species of plant-lice found upon currant and gooseberry in Maine, none of which, however, complete their life-cycle on these plants. Some species occur on them in the spring in an apterous form, a migrant winged form follows, which spends the summer on other vegetation, and in the autumn a succeeding

generation returns to the spring host-plant. These give rise to a sexual generation which produces the winter-eggs. The autumn lice which are less numerous, do less damage, as the loss of sap at that time of year is less serious. This species winters on the elm and migrates in the summer to the fruit bushes. *Aphis varians*, sp. n. (white-cornicled currant aphid) is a very abundant species, possibly synonymous with *grossulariae*, Kalt., which is found upon cultivated currant, flowering currant and wild gooseberry during May and June, and was reported as very serious in West Paris, Maine, in 1910–11–12. In Maine, the stem-mother matures early in May, and is found on the under-surface of the leaf, which puckers considerably. The third generation appears early in June, and when the wings have developed, migration to the summer food-plant occurs.

*Aphis sanborni*, sp. n.; this green gooseberry aphid is probably the species described, but not named, by Sanborn in '*Kansas Aphididae*' (1904), pp. 50–51 and fig. 71. It was found in 1913, at High Moor Farm, and the collection taken on 28th May comprised stem-mothers, apterous females of the second generation and the third generation, which points to the gooseberry as the winter host, though the full life-cycle has not been followed.

*Rhopalosiphum lactucae* (?) Kalt., is common in Maine in spring upon currants, and is probably the same as that found on sow thistle (*Sonchus arvensis*), in summer, for it agrees with *lactucae* recorded from *Sonchus* in Germany. The leaves do not cluster so tightly as do those attacked by *A. varians*. During the end of June, alate and apterous pupae and nymphs are still found on the currant, later the alate females appear to migrate to lettuce and sow-thistle.

*Myzus ribis*, L., only attacks the leaves, forming red or yellow blisters, one result being the premature ripening of the fruit. The stem-mother matures in Maine about mid-May, and the second generation appears to be both alate and apterous. Both these forms are found on currant as late as mid-July. The summer food-plant is unknown, although *M. ribis* has a world-wide distribution. *M. dispar*, sp. n., is closely allied to the last species, the differences though slight are constant. *Macrosiphum lactucae*, a common species on cultivated currant and gooseberry, is provisionally recorded, though transfers to *Sonchus* or lettuce have not been yet successful. *Schizoneura ulmi* (*fodiens*), though not yet recorded on the gooseberry or currant in America, is known in Europe. These are the summer food-plants, the English elm, *Ulmus campestris*, harbouring this species through the winter and in spring [see this *Review*, Ser. A, ii, p. 208].

CAPUS (J.). **Le Traitement de l'Eudémis.** [The treatment of *Polychrosis*.]—*Rev. Agric. et Vitic. de l'Afrique du Nord, Algiers*, xii, no. 111, 25th April 1914, pp. 395-396.

The treatment instituted by the author and by Dr. Feytaud in 1912 against the first generation of the vine-moth, *Polychrosis botrana*, consisted of spraying the vines with a Bordeaux mixture containing nicotin. Recent experiments have shown that the best results are obtained when the spray is used at the time when the adult moths are most numerous. In the Department of Gironde, this period was

between the 9th and 19th of July. The author does not recommend further spraying against the autumn generation of the moth, which, in any case, should be scarce if the earlier sprayings have been carefully performed; should the moth be still abundant it should be controlled with liquid bait-traps.

TOMEI (B.). **Malattie delle piante.** [Diseases of Plants.]—*Lib. I: Cattedra Ambulante Prov. d'Agricultura, Urbino*, 1913, 111 pp.

The author is Director of the Cattedra Ambulante of Urbino, and this little book is intended to give shortly, in very simple language, an account of insects and other pests of cultivated crops. The first part deals with wheat, maize, beans, potatoes, tobacco, lucerne, trefoil, Maltese clover (*Hedisarum coronarium*) and sainfoin, and their pests, which are dealt with according to the parts of the plant attacked. A brief description is given of each, sufficient to attract the attention of the farmer and to cause him to make further inquiry; the remedies are dealt with in the same manner, and a good deal of information is given as to manuring and general cultivation which will assist the plants to resist their enemies.

JARVIS (E.). **A new Fruit-boring Caterpillar of Bananas occurring at Tweed Heads,** *Heteromicta latro.—Queensland Agric. Jl., Brisbane*, April 1914, pp. 280-284, 1 plate.

The larvae of this Pyralid moth, which infests bananas, have also been found tunnelling the trunks of grass-trees (*Xanthorrhoea* sp.) and it probably breeds freely in grass-tree country. The author warns banana-growers, especially those on the southern border of the State, to watch for early signs of *Heteromicta latro* infesting their fruit. In the Tweed River district the insect has been known for about seven years and is now to be found in most banana plantations. Injury is usually seen on isolated trees, but as a rule only a few fingers of a bunch are attacked. The excreta of the larvae are visible on the damaged skin, webbed together and obscuring the entrance hole, which is always situated near the flower end of the fruit. Only about an inch of the fruit is injured and the rest ripens normally unless subsequently attacked by a fungus such as ripe-rot (*Gloeosporium* sp.). Hymenopterous parasites, of which two species were bred by the author, keep this moth in check, and so far serious damage has not occurred. All infested fruits should be picked and should not be burnt, but kept in large wooden cases covered with perforated zinc, (1-16th inch mesh), which will allow the parasites, but not the moths, to escape. Grass-trees in the neighbourhood of banana plantations should be rooted out and burnt.

The common maize-moth (*Dichocrocis punctiferalis*) has recently attacked green bananas, entering the pulp at the flower end; growers are therefore warned against growing maize near bananas. In some bananas submitted for examination, the pupae of a beetle, apparently *Doticus pestilens*, which is known to attack apples in Victoria, were found. These diseased bananas also harboured a species of NITIDULIDAE, closely allied to *Carpophilus hemipterus*, well known in dried Turkey figs.

Caesar (L.). **The Chief Insect Pests of Currants and Gooseberries.**—*Ontario Dept. Agric., Toronto*, Bull. 222, April 1914, pp. 33-36, 3 figs.

This bulletin deals with the culture of currants and gooseberries, and their insect pests are briefly mentioned. The currant sawfly (*Pteronus ribesii*) attacks currants and gooseberries and is common and destructive. Eggs are deposited in chains on the veins underneath the leaves, and defoliation by the larvae is often complete. The second brood appears as the fruits are ripening, and winters in the ground in earthen cocoons. This insect may be controlled by spraying with 2 lb. lead arsenate to 40 gallons of diluted lime-sulphur, or of Bordeaux mixture, applied just before flowering and again when the fruit is set. Should the second brood appear, 1 oz. of hellebore to a gallon of water should be applied at once, as arsenicals must not be used on the fruit at this stage. The imported currant-borer (*Aegeria tipuliformis*) is common in most plantations. The moths appear in June in Ontario, and eggs are deposited in the axils of the leaves, or in cuts in the bark; the young larvae bore into the pith where they feed until full grown the next year. Spraying is no use against this pest. A system of pruning should be carried out by which wood is cut out after bearing one or at most two crops, young wood being allowed to take its place. All prunings must be burnt before the end of May. Against the currant aphis, (*Myzus ribis*), "Black Leaf 40" with lime-sulphur should be used as soon as the winter eggs have hatched, but before the buds open, followed by a similar spray from below just before flowering. Kerosene emulsion or whale-oil soap, 1 lb. in 6 gallons of water is an alternative, but should not be combined with lime-sulphur. Red spiders (*Tetranychus bimaculatus*) spin a fine web on the under surface of the leaves beneath which they feed and deposit their eggs. Lime-sulphur used as for the other pests will control them. For San José and oyster-shell scales, which attack currant bushes and sometimes gooseberries, lime-sulphur should be used, having a specific gravity of 1·032 to 1·035, or commercial lime-sulphur 1 gallon in 8 of water.

Rutherford (A.). **Termites.**—*Trop. Agric., Peradeniya*, xlii, no. 4. April 1914, pp. 305-307.

A termite, probably *Calotermes militaris*, Desn., has been found attacking tea plants in Ceylon; in one case the red-borer had been present, and the termites appeared to have worked from their tunnels through the rest of the plant. Carbon bisulphide is a good remedy, failing a Universal Ant Exterminator. During some demonstrations on the use of dynamite for subsoiling, an experiment was made as to the use of this explosive to destroy termite nests; the results were negative, as within nine days the insects were rebuilding their nests, or were building fresh ones at a few yards distance. A demonstration was also given by Mr. Bandara-Beddewela with his termite mixture [see this *Review*, Ser. A, i, p. 74]; nine days later the ants had begun building again, but by the 24th day from treatment, all the nests were deserted, including, however, the control nest. Further tests, carried out by the author, failed to demonstrate that the mixture was distasteful or poisonous to the termites. Wood impregnated

with "Cordirol" was tested against termites, but was not found to be protected from their attacks.

Rutherford (A.). **Plants other than Tea from which** *Xyleborus fornicatus* **(Shot-hole Borer of Tea) has been taken.**—*Trop. Agric., Peradeniya,* xlii, no. 4, April 1915, pp. 307-309.

The shot-hole borer does not frequent *Grevillea* or *Albizzia stipulata,* though it may attack sickly branches. There are several records of *X. fornicatus* occurring in *Albizzia moluccana,* but opinions differ as to the condition of the plants attacked. In some cases the insects occurred in large numbers in twigs and branches already killed by a fungus, and the presence of several species indicated that they were not the primary cause of injury; but in another case the infested branches showed no original fungus disease. Yearling plants of *Crotalaria striata* are reported as being attacked in one instance, and deserted tunnels were once found in loquat, and in castor oil plants all stages of the borer were present. Green found what was apparently this species tunnelling only in dead wood in Para rubber, and also reports a single case of specimens alleged to have been taken from guava, and twigs of *Bixa orellana* were apparently attacked by this borer, which also attacks isolated cacao trees growing amongst tea. The quantity of gum present in the bark of healthy cacao trees protects them, but should the vitality of the tree be lowered by canker or other disease, it may be attacked; such trees, in a favourable condition for the breeding of these beetles, are therefore a great menace to tea plantations; when cultivating cacao, all dying branches should be removed and the cut surface tarred. The author found several specimens of a large black thrips in galleries of *X. fornicatus,* in this tree, but they did not appear to be predaceous. An avocado pear tree growing near an infested tea plantation suffers periodically from the attacks of this beetle, and the author has also observed sporadic overflow infestations in *Poinciana regia, Bauhinia* sp., and *Aberia gardneri.*

Uriupinsky (M.). **Смородинный клещикъ.** [*Eriophyes ribis,* Nal.] —**Бюллетень о вредителяхъ сельскаго хозяйства и мѣрахъ борьбы съ ними.** [*Bulletin on the pests of Agriculture and methods of fighting them.*] Published by the Entomological and Phytopathological Bureau of the Zemstvo of the Govt. of Charkov. *Charkov,* no. 3, April 1914, pp. 12-15, 3 figs.

The author in May 1913 found numbers of mites, *Eriophyes ribis,* on black-currant plants, the buds of which had not unfolded. He recommends the following method of discovering and examining these mites: attacked buds are placed in a dry glass tube and the mites will soon leave them and settle on the walls of the glass; they can then be preserved by filling the glass with 60° alcohol. Buds attacked by these mites wither and drop off about the middle of June; the mites emerge from the buds, oviposit in new ones and then die; a new generation appearing the following year. The mites are spread from place to place through the agency of winds, birds or insects, also through young shoots of currants used as cuttings. [The deformity produced is known in England as "Big bud."—Ed.]

Very little information is available as to the natural enemies of these mites, but the author found a small Chalcid parasite in a bud; whilst Korolkov reports that in Moscow he found inside the swollen buds of currants the larvae of a Cecidomyid, and Collinge records the larvae of *Coccinella 7-punctata* as an enemy of these mites. Both normal and infested buds are figured.

The author recommends the destruction of attacked buds and, in cases of serious infestation, of the shoots or even the whole plant; the careful removal of rubbish, leaves and infested ends in late autumn and early in spring; the powdering of previously moistened plants with a mixture of one part of finely ground unslaked lime and two parts of flowers of sulphur in March, April and May. As preventive remedies he recommends the planting only of seedlings or cuttings known to be immune, the French varieties of black-currants and also the English "Boskoop Giant" being considered to be free from infestation. [See this Review, Ser. A, i, pp. 139–140.]

TRZEBINSKI (Dr. J.). **Sprawozdanie za rok 1913 z działalności stacji ochrony roślin w Warszawie.** [Report for 1913 on the activity of the Station for the protection of plants in Warsaw.]—Reprint from *Rocznika Tow. Ogrod. Warsz.* [*The Annual of the Warsaw Horticultural Society*] *for* 1913, *Warsaw*, 40 pp., 2 figs., 1914.

This is mainly a report on experiments with remedies against fungus diseases conducted by the Station, but some experimental sprayings against insect pests of plants were also undertaken. Spraying of firs against *Chermes abietis*, Kalt., with tobacco extract and oil or Bourdon's paraffin-soap mixture were not conclusive, as the numbers of galls on sprayed and unsprayed trees were nearly the same. The paraffin mixture caused the needles of the firs to turn a brown colour and drop off, which is possibly to be attributed to the double quantity of kerosene erroneously taken for the preparation of the insecticide. Tobacco emulsion did not damage the needles. Both insecticides were prepared according to recipes recommended in "Arbeit aus der Kais. Biol. Anst. f. Land. und Forstwirtschaft," vol. vi, no. 2. At the beginning of July, *Chermes viridanus*, Cholodk., appeared in large numbers on larch in the nurseries of Warsaw. Spraying with the usual kerosene soap-emulsion and with a 2 per cent. solution of "milonaphtha" (soap-naphtha), prepared by the firm of Nobel Bros., proved very effective, but the latter remedy caused the needles to turn yellow.

Amongst the queries as to remedies against insect pests addressed to the Station from Russian Poland and also from neighbouring governments, 8 queries related to Coccids, 10 to Aphids, 6 to *Eriophyes piri*, 4 to *Schizoneura lanigera*, which appeared last year in many gardens of the governments of Warsaw, Kalish and Kieletzk, 6 to larvae of *Melolontha*, 6 to larvae of ELATERIDAE and 11 to various thrips, which injured grain crops.

**Извѣстія Сухумской Садовой и Сельско-Хозяйственной Опытной Станціи.** [Bulletins of the Horticultural and Agricultural Station], *Suchum*, no. 14, 1914, pp. 11-15 and 62.

This issue of the Bulletins consists of a report on the work of the

Station in 1913, a programme intended to be carried out in 1914 and some estimates for 1915. There is an Entomological Section at the Station, a report of which is also included.

The chief pest of orchards is *Schizoneura lanigera*, Hausm., control of which is conducted only in the nurseries; the local variety of apple called "Abchaz-apple" is not attacked or only little injured by this pest.

*Cydia pomonella* and *Rhynchites pauxillus*, Germ., occur everywhere and are very injurious. Other pests include *Thrips*, on various nursery plants; *Lachnus persicae*, on peaches, which however does not do serious damage, even when present in large numbers; *Lepidosaphes ulmi* (*Mytilaspis pomorum*), and other COCCIDAE; *Zeuzera aesculi*, *Vanessa polychloros*, *Lymantria* (*Ocneria*) *dispar*, and some species of TORTRICIDAE and of SCOLYTIDAE. Among market-gardens pests the report mentions: *Pieris brassicae*, *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.), *Athalia spinarum*, F., and some Halticini.

*Pyrausta nubilalis* (*Botys silacealis*, Hb.), and *P. quadripunctalis*, Schiff., are injurious to maize, the infection of cobs and stalks of this plant in some localities amounting to 50 per cent. *Siphonophora scabiosae*, Buckt., and *Thrips* are pests of tobacco. Grain stores are injured by *Tinea granella*, L., and by *Calandra granaria*, L., which are both important pests in this district. Insect pests in Suchum are numerous and the gradual study of their biology will, it is hoped, enable the best methods of controlling them to be discovered.

During the current year it is intended to study especially the biology and control of *Schizoneura lanigera*, Hausm., COCCIDAE, *Athalia spinarum*, F., *Cydia pomonella*, and some others of the previously mentioned pests. Spraying experiments and the collection of entomological specimens will also be undertaken.

KOKUJEV (N.). **Hymenoptera parasitica nova faunae turanicae a V. I. Plotnikov collecta.** [Parasitic hymenoptera new to the fauna of Turkestan, collected by V. I. Plotnikov.]—*Revue Russe d'Entomologie, St. Petersburg*, xiii. nos. 3 and 4, 28th March 1914, pp. 513, 514.

The author describes *Habrobracon simonovi*, bred from larvae of *Chloridiea obsoleta* (*Heliothis armigera*), and *Chelonus caradrinae*, and *Microplites rufiventris*, bred from larvae of *Caradrina exigua*.

**Примѣненіе въ садахъ желѣзнаго купороса.** [The application of Iron Sulphate in Orchards.]—**«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza.*] *Astrachan*, no. 5, May 1914, pp. 307-308.

The application of iron-sulphate is recommended in this article, chiefly in order to destroy moss and lichen on trees, but also as a remedy against *Psylla mali*. For the latter purpose a 3 per cent. solution (1 lb. of iron sulphate in 11 quarts of water) is recommended to be sprayed before the buds swell. This remedy does not, however, always lead to a total destruction of the eggs of this pest, and a further

spraying with tobacco extract ($\frac{1}{2}$ or $\frac{3}{4}$ lb. of tobacco extract in 11 quarts of water) is recommended immediately after the larvae have hatched.

RODZIANKO (V. N.). **О нѣкоторыхъ бабочкахъ, гусеницы которыхъ повреждаютъ сосновыя посадки близъ г. Кіева.** [On some Microlepidoptera, the caterpillars of which injure pine-plantations in the environs of Kiev.]—*Kiev*, 1913, 10 pp.

In May 1912, the author obtained from forests in the government of Kiev samples of the leading shoots of young pines, the terminal buds of which were damaged by Microlepidopterous larvae ; later he obtained some young green, but longer shoots of the same pines, also damaged by these caterpillars, from which he bred three species of moths, one belonging to the PYRALIDAE and two to the TORTRICIDAE. The former is described by the author as a new variety, viz. :—*Dioryctria* (*Phycis*) *abietella*, var. *pinetella*, Rodz., and he also refers to the closely allied *D.* (*Phycis*) *splendidella*, H. S., which has been reared from pine-cones and diseased pine-branches. The larvae of *D. abietella* injure the cones and shoots of *Picea excelsa* and *Abies pectinata*, Dec., in which they make mines ; they live also in the galls of *Chermes*. According to Ratzeburg, and Judeich and Nietsche, these caterpillars breed also inside the cones, but not in the shoots and branches, of *Pinus silvestris*, although some other authors, such as Rössler, Sorhagen and Meyrick, report having found them there. The author points out that the form of *Dioryctria* reared by him is more distinct from *D. abietella* than is *D. schützeella*, Fuchs, which is regarded as a separate species. He suggests that the varied food of the different forms of *Dioryctria* is responsible for the difference in the colour and markings. The larvae of the variety he describes lived in mines, burrowing in the interior of young green shoots on the tips of small pines. From larvae collected in June 1912 he reared the first moth on 17th July, and the last ten days later. The caterpillars pupated in cocoons spun between the needles. He describes the larvae, pupa and imago, and recommends as a remedy collecting and destroying the damaged shoots while the caterpillars are still inside.

Two species of TORTRICIDAE, *Rhyacionia* (*Retinia*) *buoliana*, S. V., and *R. duplana*, Hübn., were reared by the author. The larvae of the former were found in webs on the summits of young pines. In the second half of June the caterpillars pupated in the webs, the moths emerging about a fortnight later. Only one generation occurs, and these caterpillars winter and proceed to feed and develop further next spring. The author describes the injury done by the caterpillars, and recommends the collection and destruction of the infested shoots while they are still inside.

*Rhyacionia duplana* is the commonest species near Kiev, at least in 1912. The larvae mine inside young pine-shoots ; there is only one brood during the summer, the winter being passed in the pupal stage. The caterpillars reared by the author in the laboratory spun their cocoons inside the mines in the shoots ; attacked shoots should be destroyed.

Börner (C.). **Experimenteller Nachweis einer biologischen Rassendifferenz zwischen Rebläusen aus Lothringen und Südfrankreich.** [Experimental proof of a biological race-difference between the Phylloxera from Lorraine and the South of France.]—*Zeitschr. für angewandte Entomologie, Berlin*, i, no. 1, April 1914, pp. 59-67.

The subject-matter of this address has been dealt with before in these pages [see this *Review*, Ser. A, ii, p. 156.]

Orth (—). **Die Reblaus in Franken.** [Phylloxera in Franconia.]—*Zeitschr. für angewandte Entomologie, Berlin*, i, no. 1, April 1914, pp. 50-58, 1 map.

First discovered in Franconia in 1902, Phylloxera has since been found in many localities there, but the total area infested only amounts to about 173 acres, or about 1 per cent. of the total devoted to vine-growing. Control may therefore be said to be successful. In the inspection of vineyards every stock is examined.

Rübsaamen (E. H.). **Die Bekämpfung der Reblauskrankheit in Preussen.** [Phylloxera-control in Prussia.]—*Zeitschr. für angewandte Entomologie, Berlin*, i, no. 1, April 1914, pp. 20-49, 2 figs.

The search for and destruction of infested stocks (an operation of much difficulty) is the only efficacious method of Phylloxera control where the introduction of American stocks is not attempted. The latter is an expensive method, not always possible to the small vine-grower, and the author thinks it is unnecessary as yet in the Rhine provinces of Prussia, where the success so far gained seems to point to the possibility of rooting out the evil. In the districts under the author's supervision, the examination of both sides of each stock was introduced in 1903, and has since been adopted throughout the Rhine province. The search squad consists of a chief, 7 experts and 7 labourers. At least 4 roots of each stock are examined. The cost per examined stock varies from 2*d.* to 3*d.* That this slow, somewhat costly, but thorough examination is successful, is proved by the fact that but few new centres of infection are discovered in the ground examined in this manner. On an average, a squad can inspect 625 acres of non-infested vineyards in 12 weeks and 125–200 acres in infested ones. The work is done strictly in accordance with a yearly time-table, from mid-June to mid-September. The destruction of a centre of infection is carried out as follows:—The vine-stocks are cut down and burned; about 10 oz. of carbon bisulphide is used per square yard, in holes from 6 to 8 inches deep; after the vine and the *Phylloxera* have been killed by the gases, the vine is uprooted; a second treatment with carbon bisulphide follows, about 5½oz. per square yard being used; the ground is then watered with Kresol solution. A 10 per cent. solution of Kresol, made up according to the German Pharmacopeia (4th Edition), was found absolutely deadly to *Phylloxera*, including the eggs. In the Rhine province, watering with Kresol is not done, for as the soil is but slightly moved, as compared with former methods where it was dug up to a considerable depth, the Phylloxera is not brought to the surface. Besides being unnecessary, Kresol communicated an unpleasant flavour to the grapes of

neighbouring vineyards, and compensation claims had to be settled. The work of destruction begins in spring and ends about the middle of October. In the safety-zone round the centre of infection, the vines are cut down in spring (if not already done in autumn) to within 8–12 inches from the ground and burned; 3½ pints of 15 per cent. Kresol solution are then poured on each stock, and then about 10 oz. of carbon bisulphide per square yard is applied in holes from 4 to 6 inches deep. This simplified procedure has resulted in a great saving of expense. The average cost of disinfecting one acre of vineyard has decreased from about £137 to about £75, in spite of increased cost of materials and labour. Equally good, but not superior, results were given by the more expensive Saprosol [see this *Review*, Ser. A, i, p. 544]. As liquid carbon bisulphide is ineffective in the upper layers of the soil and seriously damages adjoining vineyards, trials were made to prevent this. It was found that a trench, 1 yard or more in depth, did not prevent damage to neighbouring vineyards except in heavy, compact soils. Carbon bisulphide emulsion was tried without success, and experiments were made with a jelly containing about 80 per cent. of the chemical. A 4-in. hole at each stock was charged with about 16 oz. of jelly (containing about 13 oz. of carbon bisulphide) and then filled in with earth, no Kresol being used. Five weeks later, an examination showed the result to be a great success, and other trials demonstrated that the use of the jelly, though it costs as much as Kresol and liquid bisulphide, permits the work to be done more quickly and avoids injury to neighbouring vineyards. Trials with carbon tetrachloride and ethane tetrachloride jelly were made and the latter will be tested again. Legislation, which has been found valuable, includes the prohibition of "Weinbergdriesche" or vineyards left unpruned and untended for two consecutive years, and the prohibition of replanting extending to 8 years in the Rhine province [see this *Review* Ser. A. i, pp. 273-274]. This long period results in the destruction, by starvation, of any *Phylloxera* which may escape the treatment. *Phylloxera* is capable of living for many years on root-fragments, and will increase as soon as the ground is replanted with vines. The campaign in Hesse-Nassau and the Rhine province has been successful in controlling the spread of infection, and at present only 4·7 per cent. of the vine-growers there have suffered.

SCHOLL (E. E.). **Grasshoppers and their Control.**—*Texas Dept. Agric., Austin*, Circular, 22nd April, 1914, 6 pp.

This circular gives instructions for the control of various grasshoppers and recommends that steps should be taken to prevent such an infestation as occurred in Texas in the early summer of 1913. The increase of these pests was due to the dry weather of recent years (so unfavourable to the growth of the fungus diseases which attack grasshoppers), to the abandonment of a number of farms and their consequent neglect, and to the destruction of the adults of the blister-beetle which feeds on garden and field crops, but as a larva devours the eggs of grasshoppers. The life-history varies slightly with the species, but usually the eggs are deposited in well-drained firm soil in the late summer and autumn, the clusters numbering from 30–100 in a pocket. In Texas, the eggs hatch from the middle of March until mid-May;

the nymphs remain near the pockets for several days, clustering together at night and on cool cloudy days ; this is a favourable opportunity to burn them with a torch or prickly-pear burner, and while they are yet feeding near the ground they can be crushed with a roller. As development proceeds and food becomes scarce, the grasshoppers migrate in search of food, and although general feeders, they prefer cultivated crops such as maize, cotton, lucerne, etc., hiding when the temperature is low in rubbish and weeds. This fact suggests placing along the fences bundles of straw which should be burnt after the insects have collected in them. When migration begins they often travel only in one direction, and barriers should be made, formed by a ditch 18 inches deep and 2 feet wide, with the side next to the threatened field, perpendicular ; post-holes 15 feet apart will soon be filled with the grasshoppers, which can be killed with hot water or oil, and fresh holes should be dug as required. Should the making of a ditch be impracticable, fences of tin or wood can be put up, and post-holes dug outside or poison baits placed outside the fence. The poison acts slowly and it is from 8 to 88 hours before the grasshoppers will succumb, though they do not usually feed after taking the poisonous mixture. Two baits are recommended. The first consists of 40 lb. wheat bran, 3–5 lb. arsenic or Paris green, 2 gallons sorghum molasses, and about 2 gallons of water ; the dry materials to be well mixed together and the molasses and water added, and applied in rows across the line of advance, near the fence and weeds which provide cover. For bait No. 2 (Griddle mixture) take 30–40 lb. fresh horse manure, 2–3 lb. arsenic or Paris green, 2 lb. salt and water to moisten, mix well and apply as No. 1. These baits should be put out in the afternoon, so that they do not dry and are ready when the insects are hungry. They should not be used where stock or poultry have access, though there is less danger of poisoning animals with bait No. 2. Grasshoppers may be kept from fruit trees by putting a 6 inch band of smooth tin around the trunk, or wrapping it with cotton or paper smeared with coal-tar or tanglefoot. The hopper-dozer gives good results in grain or lucerne fields ; the borders of fields adjacent to woodlands and meadows should be kept smooth, so that the hopper-dozer can be used when the infestation occurs. Egg-capsules ploughed under to a depth of 8 inches may hatch, but the young will be unable to reach the surface. Autumn ploughing, followed by occasional harrowing, is an excellent method of destroying the eggs ; where there is irrigation, flooding is valuable. The co-operation of all farmers in the destruction of these insects is urged.

Bodkin (G. E.). **The Grass Moth,** *Remigia repanda.—Jl. Bd. Agric., Brit. Guiana, Georgetown,* vii, no. 4, April 1914, pp. 171-177.

The larvae of *Remigia repanda*, F., feed upon sugar-cane, rice, Para and other grasses throughout the year, appearing in great numbers after rain, following a long drought. They occur throughout the coast lands of the Colony and in several districts of the interi or,and are also recorded as a pest in Trinidad and Jamaica, besides over a wide area in North and South America. Normally the grass-moth is easily controlled and does no serious damage, but fields of young sugar-canes between two and four months old are sometimes stripped ; the larvae

are often in company with the rice caterpillar (*Laphygma frugiperda*, S. and A.), which destroys rice plants of all ages. Fields of Para grass (*Panicum muticum*) grown for fodder are defoliated, the larvae migrating to fresh fields in great numbers. During the serious infestation of 1912 the numbers of the second and third generations were reduced to normal by parasites. The various instars in the life-history of *Remigia repanda*, in British Guiana, correspond with those described in detail by Dyar (Proc. U.S. Nat. Museum, xxiii, p. 276) ; the egg period lasts 3 or 4 days, the larval 14 to 17 days, and the pupal 9 to 10 days. The larva is called by the Creoles the " measure worm." The natural parasites, which undoubtedly exist in British Guiana, have not yet been obtained. The Coccinellid, *Megilla maculata*, de Geer, and the Demarara robin (*Leistes guianensis*) feed on the larvae. On sugar estates the usual control measure in small infestations is hand-picking, while dry powdered arsenate of lead is also recommended as being equally satisfactory and cheaper. When nursery-beds of rice are attacked, flooding is an effective method, as advised against the rice caterpillar [see this *Review*, Ser. A, i, p. 318]. The value of a crop of Para grass hardly allows of control measures, but where there is a severe infestation, the field should be burnt after the larvae have pupated.

**Parasite Determinations.**—*Jl. Bd. Agric., Brit. Guiana, Georgetown*, vii, no. 4, April 1914, p. 200.

The British Guiana Board of Agriculture has recently received determinations from Mr. J. C. Crawford of several insect parasites. The black parasite so often found in the eggs of *Diatraea saccharalis* and *D. canella*, in the cane-fields of British Guiana is named *Prophanurus alecto*, Cwfd., sp. n. Other determinations are as follows : *Arrhenophagus chionaspidis*, Auriv., bred from *Chionaspis citri*, Comst., and *Hemichionaspis minor*, Mask. ; *Leptomastix dactylopii*, How., bred from *Pseudococcus citri*, Risso ; *Prophanurus thais*, Cwfd., sp. n., bred from the eggs of a Pentatomid bug ; *Holcencyrtus calypso*, Cwfd., sp. n., and *Elachertus meridionalis*, Cwfd., sp. n., bred from larvae of *Calpodes ethlius*, Cram. ; *Aphanurus bodkinii*, Cwfd., sp. n., bred from ova of *Empicoris variolosus* L. (PENTATOMIDAE) ; *Chalcis pandora*, Cwfd., sp. n., bred from the pupa of a Hesperid butterfly on sugar-cane ; *Aplastomorpha pratti*, Cwfd., bred from *Lasioderma serricorne*, F. ; *Prophanurus minutissimus*, Ashm., bred from the ova of a Noctuid moth.

**Predaceous Coccinellidae in British Guiana.**—*Jl. Bd. Agric. Brit. Guiana, Georgetown*, vii, no. 4, April 1914, p. 200-201.

Through the Imperial Bureau of Entomology the following determinations have been received of COCCINELLIDAE which are exceedingly useful in destroying harmful COCCIDAE in British Guiana : *Azya pontbrianti*, Muls., preying on *Saissetia hemisphaerica*, Targ., and *S. oleae*, Bern. ; *Hyperaspis trilineata*, Muls., destroying the sugar-cane mealy-bug (*Ripersia* sp.) ; and *Brachyacantha 10-punctata*, Melsh., predaceous on *Pseudococcus* sp.

AVERIN (A. G.). **О луговомъ мотылькѣ.** [On *Phlyctaenodes sticticalis*, L.]—**« Бюллетень о вредителяхъ сельскаго хозяйства и мѣрахъ борьбы съ ними.»** [*Bulletin of pests of Agriculture and methods of fighting them.*] Published by the Entomological and Phytopathological Bureau of the Zemstvo of Charkov. *Charkov*, no. 3, April 1914, pp. 15-16.

The author refers to the outbreak of *Phlyctaenodes* (*Eurycreon*) *sticticalis* which occurred the previous summer, and to the infertility of the females of the second generation which appeared after the end of July. At the same time some of the caterpillars of the first generation did not pupate, but remained over the winter in their cocoons. Both the infertility and the non-pupation were due to diapuse. In order to be able to establish the exact number of hibernated caterpillars, the author suggests that digging operations should be undertaken, and in case of discovery of cocoons with living larvae or pupae, that the finders should communicate with the Bureau.

LOVELAND (C. W.). **Cutworms.**—*Bull., Rhode Island Sta. Bd. Agric., Providence*, May 1914, 8 pp., 2 figs.

This bulletin contains recent remedies for the control of cutworms. Where grass-land is to be ploughed up, the turf should be sprayed with arsenate of lead a few days previously ; after harrowing, the survivors of the cutworms may be destroyed with poisoned bran. Spraying the weed-grown borders of fields, and the dipping in arsenate of lead of plants about to be set, is also advised. Young cabbages and tomatoes may be surrounded with cylinders of tin or cardboard when first planted, or trapping with pieces of board between the rows, and hunting with a lantern at night may be tried. The short rotation of crops is also advised.

**Къ борьбѣ съ кобылкой.** [The campaign against locusts.]—**« Сибирское Сельское Хозяйство.»** [*Siberian Agriculture,*] *Tomsk*, no. 10, June 1914, pp. 292-293.

This journal quotes a statement from a local paper as to the prospective campaign against locusts in the province of Akmolinsk and surrounding governments. Some 1,050 square miles in the government of Tobolsk have been infested by egg-clusters of locusts, according to investigations in 1913. The campaign will consist in spraying operations, about £7,000 having been assigned for this purpose, in the form of a loan to the local population, to be repaid in 10 years. In order to conduct the campaign, the whole country has been divided into 26 districts, the average area of each being about 40 square miles.

**Красные паучки на огурцахъ.** [Red spider on cucumbers.]—**« Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan*, no. 6, June 1914, pp. 366-367.

An article, reprinted from the Russian journal, *The Fruit-Grower and Market-Gardener*, deals with the damage done to cucumbers by *Tetranychus telarius*. This mite, which is so small that it can only be seen with the aid of a magnifier, injures cucumbers and various other plants grown in hot-beds.

According to Kiese, of Erfurt, these mites can breed only when the air in the hot-beds becomes dry and their development is assisted when the earth is loose and dries quickly. Should the pest appear, the plants must be immediately sprayed with tobacco-extract, the hot-beds being fumigated with sulphur and the walls and frames sprayed with tobacco extract and limewashed.

Schumann, of Detmold, recommends powdering the leaves with tobacco dust or spraying with soap nicotin emulsion, or with soap to which some lysol or kerosene is added. This remedy cannot be applied in the case of plants which already bear blossoms and set fruit, as the emulsion injures them.

Sacharov (N.). **О нѣкоторыхъ инсектисидахъ и фунгисидахъ, употребляемыхъ безъ извести.** [On some insecticides and fungicides used without lime.]—**«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan*, no. 6, June 1914, pp. 378-381.

The Astrachan Station has experimented on some insecticides which can be used without lime, it being very difficult to obtain quick-lime of good quality in the government. Good results were obtained with "lazurine" against vine-mildew. During the year comparative experiments were conducted with "djipsin" and "uraniagrin," the first-named not proving effective, while uraniagrin was successful against the larvae of *Apocheima* (*Biston*) *pomonaria*, Hb., *Euproctis chrysorrhoea*, *Clisiocampa* (*Malacosoma*) *neustria*, *Hyponomeuta malinellus*, and a Noctuid. In the case of caterpillars of *Apocheima pomonaria*, Hb., the death rate from Paris green was 80 per cent., from uraniagrin 70 to 72 per cent., from djipsin nil; in another experiment the death rate from uraniagrin was 75 per cent., from djipsin 11 per cent. Uraniagrin is a bright green powder, very thin, easily mixed with water, does not settle down in the bottom of the sprayer, nor burn the leaves, and requires no lime; the proportion necessary for the destruction of the caterpillars is about 1 lb. in 65 gallons of water.

**Борьба съ саранчей.** [The campaign against locusts.]—**«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan*, no. 6, June 1914, p. 409.

The hatching of locusts in 1914 occurred later than was the case in the previous year, the first hatching in the southern parts of the government having been recorded between the 24th and 26th May. The total area attacked is smaller than last year, while the number of spots infested is greater and they are more widely distributed over the whole delta of the Volga. The campaign was started immediately after hatching, and Paris green gave excellent results. No hatching took place in localities where in the previous year measures were taken against the pest. The egg-clusters in the southern part of the district of Zarev along the "limans" (a name given in S. Russia to lagoons formed by the great rivers) have perished, and no hatching has been yet noticed in the northern part of this district.

**Отчетъ о дѣятельности Кіевской Станціи по борьбѣ съ вредителями растеній при Южно-Русскомъ Обществѣ Поощренія Земледѣлія и Сельской Промышленности за 1913 годъ.** [Report on the work at the Kiev Station for the fighting of plant pests of the South Russian Society for promoting Agriculture, for 1913.]—**«Хозяйство.»** [*Choziaistvo*], *Kiev*, no. 20, 12th June, pp. 680-686, and no. 21, 19th June 1914, pp. 713-718.

After referring to the work on various insect pests dealt with in a special report [see this *Review*, Ser. A, ii, p. 341], an account is given of further experiments on the artificial breeding of the Chalcid, *Trichogramma* (*Pentarthron*) *semblidis*, Aur., in the eggs of *Euxoa segetum* [see this *Review*, Ser. A, i, 539–541]. The work has been done on eggs of *E. segetum* laid in the laboratory, two generations having been obtained between January and June 1913. It appeared that freshly laid eggs, 1 or 2 days after deposition, are the most suitable for infection; the imago of the parasites hatches in from 9 to 12 days, and when fed on sugar-water lives up to 10 days. The females are able to oviposit immediately after emerging from the egg and during the whole of their life, whether fecundated or not, but the eggs infected by them during the first days of their life produced parasites more uniformly. Eggs of the host kept at a temperature of 27° F. for a month were still able to produce the parasites, and infected eggs can be kept at a low temperature for a period of 5 months without causing their death. These parasites also infect the eggs of *Cydia pomonella*, *Barathra* (*Mamestra*) *brassicae*, L., *Polia suasa*, Schiff. (*Mamestra dissimilis*, Knoch), and *Phlyctaenodes sticticalis*, L., the eggs of the last three species being attacked more freely than those of *C. pomonella*. The eggs of *Pieris brassicae* are infected only in the absence of others, while those of *Lymantria dispar*, L., and of *Lecanium bituberculatum*, Targ., were untouched. More details of these experiments will be published in due course.

The Station has experimented on catching insects in troughs with molasses; 26,923 NOCTUIDAE were caught between 11th August and 19th September in troughs placed on beet plantations and black fallow land to the number of about 4 to the acre; amongst these insects only 530 proved to be *E. segetum*, which is explained by the scarcity of the second generation of this species in the year under report. Caterpillars of *Phlyctaenodes sticticalis* have injured some beet plantations in the government of Poltava, and the locality being visited in June by V. V. Dobrovliansky, it was found that the injured spots were isolated from one another, comprising altogether not more than 5½ acres, the remainder of the plantations being practically free. Adults were found in small numbers, and no eggs were noticed. Trap trenches were dug round the attacked areas and the plants were sprayed with Paris green.

In May, *Melolontha hippocastani*, F., in company with single specimens of *M. melolontha*, damaged apple, pear and plum trees in one district of the government of Kiev, the foliage being devoured to a large extent. *Pogonochaerus fascicularis*, Panz., *Magdalis violacea*, L., and *Pissodes notatus*, F., caused the withering of the last year's leading shoots of pines in the Zvenigorodok Forest; the removal and burning of the attacked shoots was the remedy applied.

Borodin (D. M.). **Борьба съ вредителями и болѣзнями садовъ въ іюнѣ.** [The fight against pests and diseases of orchards in June.] —**«Хуторянинъ.»** [*Chutorianin*], *Poltava*, no. 24, 25th June 1914, pp. 697-701, 5 figs.

The chief pest of orchards in June is *Cydia* (*Carpocapsa*) *pomonella*, the caterpillars of which do enormous damage to apples, pears, plums and apricots. The author gives the remedies directed against the second generation of these pests, and especially figures and describes the mode of preparation of trap-belts. All fallen fruits should be collected and either destroyed or put for some hours in water in order to kill the caterpillars contained in them.

The author further directs attention to *Melolontha*, the pupae of which must be collected and destroyed. This remedy is only effective if applied by all the fruit-growers of the same district. The destruction of wild blackthorn is also recommended.

V. V. D. **Вопросы и отвѣты.** [Queries and answers.] **«Хозяйство.»** —[*Choziaistvo*], *Kiev*, no. 25, 17th July 1914, p. 890.

The author says in reply to a subscriber who sent to the Kiev Station samples of sainfoin, that they were injured by the larvae of *Contarinia onobrychidis*, Kieff., which suck the leaves, causing them to curl. The life-history of this insect has been but little studied, and no remedies have been discovered, but the damage done is not important.

Borodin (D.). **О попыткахъ борьбы съ майскимъ хрущомъ при помощи грибка** *Botrytis tenella*. [On endeavours to fight the larvae of *Melolontha* by means of the fungus *Botrytis tenella*.]— **«Хуторянинъ»** [*Chutorianin*], *Poltava*, no. 27, 17th July 1914, p. 792.

In reply to a subscriber the author points out that the control of larvae of *Melolontha* by means of the fungus, *Botrytis tenella*, as recommended by Le Moult and Giard, has not given satisfactory practical results, although in the laboratory the experiments proved successful.

Runner (G. A.). **The so-called Tobacco Wireworm in Virginia.**— *U.S. Dept. Agric.*, *Washington, D.C.*, *Bull.* no. 78, 18th May 1914, 30 pp., 2 pls., 5 figs.

The tobacco Crambus (*Crambus caliginosellus*, Clem.) occurs in most of the tobacco-growing districts of the Eastern States, especially in Maryland and Virginia. In the latter State, the damage to the tobacco crop from this insect alone is estimated to average at least £166,000 annually. In Maryland, *C. caliginosellus* has for many years been a serious pest of tobacco and maize, and during 1897–1900 many fields of young maize were nearly destroyed by it. It has also been recorded as damaging maize in Delaware and New Jersey. Although only recorded from North America, its preference for the naturalised Buckhorn plantain (*Plantago lanceolata*) and the oxeye daisy (*Chrysanthemum leucanthemum*) points to the possible introduction of *C. caliginosellus* from Europe. Other wild plants upon which

larvae of the tobacco Crambus have been found feeding are: wild aster or "stickweed" (*Aster ericoides* and other species), wild carrot (*Daucus carota*), sheep sorrel (*Rumex acetosella*), *Senecio jacobaea*, and white-top (flea-bane) (*Erigeron annuus*) and other species. It is probable that severe injury to cultivated crops only occurs in localities where natural food-plants are exceedingly abundant, and where crops are planted at the time the larvae are completing their growth. The eradication or control of the two chief food-plants, therefore, will result in comparative immunity from loss due to this insect.

The greatest emergence of the moths takes place during the first and second weeks of August, although individuals occur from the end of June to the beginning of September. The females die soon after egg-laying, the average number of eggs being 177, and there is apparently only one generation a year, the eggs hatching in summer and the larvae completing their growth during the following year. Most of the larvae are in the pupal stage during the first half of July. Larvae collected from maize are considerably lighter in colour than those from tobacco. The moths fly during late afternoon, on dark days, and during the early part of the night, and are attracted to light in comparatively small numbers.

When meadows are ploughed up and planted with tobacco, serious injury frequently occurs, but this is invariably due to the presence of the weeds mentioned above, and does not occur where there had previously been a clean growth of grass or clover. The larvae, which feed chiefly at night, attack tobacco soon after planting, usually just below the surface of the ground, but the whorls of terminal leaves of newly set plants are also damaged. The smaller individuals often enter the stalk and tunnel upward, and when not feeding may be found in cylindrical, web-lined galleries extending from the plant, several inches below the surface of the soil. Injured plants may usually be detected by their stunted or wilted appearance, which is especially noticeable in dry weather.

In the case of maize, the larvae attack the young plants near the ground, but when the stalks reach a height of a foot or more comparatively little damage is done. Injury is less severe in wet weather, as the plants are more vigorous and the weeds more plentiful.

Before pupating, the larvae seem to pass a rather long inactive period in their cells. Pupation takes place at a distance of from 1 to 6 inches from the food-plant and at a depth varying from one-half to 4 inches; the average duration of the pupal stage is from 10 to 15 days.

Besides spiders of several species, various Carabid beetles feed on the larvae of *C. caliginosellus*, including *Calosoma calidum*, F., and *Chlaenius tomentosus*, Say. Adults and larvae of *Harpalus pennsylvanicus*, De G., and *H. faunus*, Say, may also attack them. Ants occasionally attack the larvae and among the bird enemies are: quails (*Colinus virginianus*), kingbirds (*Tyrannus tyrannus*), the wood pewee (*Myiochares virens*), and it is thought that barn-swallows and meadow-larks are also beneficial.

As tests with various insecticides and repellants, including arsenate of lead, Paris green, tobacco extract, nicotin sulphate, tobacco-dust, kerosene, kainit, and calcium cyanamide, gave no results which would indicate any practical value, the author recommends cultural methods

of control. Field experiments, of which the details are given, show that the most effective methods of control consist of the removal of the weeds which are food-plants, combined with a systematic rotation of crops. A rotation found very satisfactory is one of seven years :—first year, tobacco, fertilised heavily; second year, wheat without fertilising; third and fourth years, mixed grasses and clover, ; fifth year, maize, with barnyard manure and a small amount of fertiliser; sixth year, cowpeas, fertilised with a little acid phosphate and sulphate of potash; seventh year, tobacco.

Summer ploughing and the growing of cowpeas the year before crops subject to injury are planted, have also been found to be effective. The author emphasises the fact that the larvae cannot survive the winter in the soil unless plants on which they are able to feed are present. A bibliography of 19 references (1860–1912) concludes the article.

Bolle (J.). **Die Schildlaus des Maulbeerbaumes** (*Diaspis pentagona*, T. T.) **und deren biologische Bekämpfung.** [The mulberry scale, *Aulacaspis* (*Diaspis*) *pentagona*, and its biological control.]—*Zeitschr. für angewandte Entomologie, Berlin*, i, no. 1, April 1914, pp. 196-213, 13 figs.

The infestation of mulberry trees by *Aulacaspis* and its control by *Prospaltella* are described and details are given of Berlese's work. The following suggestion, made by Del Guercio to the author, is thought worth adopting where the diffusion of *Prospaltella* is aimed at. A nursery is established with some hundreds of young mulberry seedlings and these are then infested with parasitised scales. The following spring the young trees are planted in groups of four to six near the infested mulberry plantations and removed two or three years later. In this way a constant source of infestation is at hand and there is no danger of *Prospaltella* being killed by the withering of the twigs on which it and its host live. The author finds that *Prospaltella* can withstand 10 degrees of frost in winter and prolonged heat, drought and humidity in summer.

Jablonowski (J.). **Ueber einen neuen Getreideschädling aus Ungarn: Halmeule,** *Oria* (*Tapinostola*) *musculosa*, **Hb.** [A new grain pest in Hungary.]—*Zeitschr. für angewandte Entomologie, Berlin*, i, no. 1, April 1914, pp. 160-171.

In Russia, the Noctuid, *Oria* (*Tapinostola*) *musculosa*, Hb., has been reported since 1882 and specially studied there by Mokrzecki [see this *Review*, Ser. A, ii, p. 391]. It was thought to be rare in Hungary, but in 1912, and more especially in 1913, it occurred in abundance there. The damage done in June resembles that done by *Chortophila sepia*, Mg., and sometimes both species may be found on the same stalk. As much as 100 per cent. of the plants may be attacked, but as a rule, only those portions of a field bordering on a road suffer from *Oria*. The summer generation of *Chlorops* also attacks the edges of the fields and this may account for the fact that *Oria* is seldom reported as a pest. The author refers to Mokrzecki as regards control measures [see ref. above.]

**Russell (H. M.). The Rose Aphis.**—*U.S. Dept. Agric., Washington, D.C., Bull.* no. 90, May 1914, 15 pp., 4 figs., 3 pls.

In this paper the author deals with the rose aphis, *Macrosiphum rosae*, L., as observed near Los Angeles, Cal., and at Washington, D.C. A description, with illustrations, is given of the various stages and of the habits. In the climate of southern California reproduction occurs throughout the year and eggs were not observed. At Washington, the author found a few eggs on the sides of dormant buds of rose-bushes on 29th November 1912. The rose aphis increases very rapidly during the autumn and spring, but during the summer the increase is less rapid and natural enemies keep it in check; in the winter development is slower and reproduction less. From October 1909 to 10th March 1910, the author carried out experiments under normal conditions in South California, from which he concludes that during winter the rose aphis may give birth to 45 young over a period of 20 days, while in the summer the period is probably shorter and the number of offspring greater, the maximum length of the life-cycle being approximately 18 days for apterous and 25 days for alate females in November. During the autumn of 1912, from observations in the insectary greenhouse at Washington, at an average mean temperature of 67° F., the period of development was shortened and the number of young increased. With a life-cycle of 25 days there would be more than 12 generations in the year, and 7 or 8 generations more in the warmer weather.

The author observed a white-crowned sparrow (*Zonotrichia leucophrys*) and on another occasion a California house finch (*Carpodacus mexicanus frontalis*) destroying large numbers of this aphid. An undetermined insect parasite of *Macrosiphum rosae* was found on 13th June 1910, the full-grown larvae having spun cocoons between the dead body of the host and the leaf; the imagos did not emerge. The author bred a Braconid, *Ephedrus incompletus*, Prov., from *M. rosae* at Washington, in 1912. Five different species of Syrphidae, some of which are figured, were reared in 1910 from larvae found feeding on *M. rosae*, namely: *Syrphus ribesii*, L., *S. opinator*, O.S., *Allograpta fracta*, O.S., *Eupeodes volucris*, O.S., and *Lasiophthicus pyrasti*, L. The adult flies were seen to desert the rose-bushes as they became shaded from the sun. Small numbers of *Hippodamia ambigua*, Lec., were seen throughout these observations, though they rarely appeared to be feeding on the aphids.

In March 1913, in a greenhouse at Washington, four badly infested bushes were sprayed with a solution made as follows: "Black leaf 40" ½ oz., whale-oil soap ½ lb., water 2½ gallons. The terminal buds and tender shoots were slightly injured, but all the aphids were killed; probably a 25 per cent. weaker solution could have been used with equal success. In another case infested rose-bushes, trained against a wall, were successfully sprayed with nicotin sulphate, 1 part in 1,000, mixed both with and without soap (the former being more efficient). Solutions more dilute than 1 part in 1,400 of 40 per cent. nicotin sulphate were unsatisfactory, though with the addition of soap they were slightly improved. The pressure was estimated at 90 lb., a compressed air sprayer and Bordeaux type of nozzle being used, with a fine driving spray. Whale-oil or

laundry soap should be added at the rate of 1 lb. to 50 gallons of the mixture. A small amount of spray may be made as follows: 1 teaspoonful of 40 per cent. nicotin solution added to 1 to 2 gallons of water, and ½ oz. whale-oil soap, shaved finely and dissolved in hot water. Solutions containing less nicotin should be mixed at the strength recommended by the manufacturers and the soap added as above. When such solutions are unobtainable good results can be got by dissolving 1 lb. of whale-oil or 2 lb. of laundry soap in from 4-6 gallons of water. Water alone applied in a forcible stream can be used as a control, but is likely to increase mildew, to which disease the roses of California are especially subject. Nicotin solutions should always be used if possible, as they give better results. Where mildew occurs copper-sulphate should be added to the nicotin solution, or a solution of copper-sulphate should be sprayed on after the water treatment, 1 lb. to 50 gallons of water or nicotin solution. The author concludes from his experiments that nicotin solutions may be used at less strength but more frequently than has before been thought necessary. In greenhouses a further dilution is necessary, but it is considered safe to use nicotin solution at a strength of 1 part to 2,000 of water, if there is no sunlight on the glass at the time.

Prell (H.). **Die Lebensweise der Raupenfliegen.** [The life-history of insect-parasites of caterpillars.]—*Zeitschr. für angewandte Entomologie, Berlin,* i, no. 1, April 1914, pp. 172–195, 7 figs.

In dealing with parasitic Hymenoptera and Diptera the author adheres to the name "Raupenfliegen" [caterpillar-flies], as he thinks it less confusing than systematic names, and also because the majority of entomoparasitic Diptera, particularly those of economic value, live in caterpillars. The oviparous and the viviparous species may be divided into three groups and the following six types of infestation result: A. Oviparous Species—I. The egg laid on the host (*Tachina*); II. The egg laid in the host (*Hyalomyia*); III. The egg laid beside the host (*Gonia*). B. Viviparous species—I. The larva deposited on the host (*Blepharidea*); II. The larva deposited in the host (*Compsilura*); III. The larva deposited beside the host (*Panzeria*).

Fischer (E.). **Ueber die Ursachen und Symptome der Flacherie und Polyederkrankheit der Raupen.** [On the causes and symptoms of Flacherie and Polyhedral Disease in Caterpillars.]—*Biol. Centralblatt. Leipzig,* xxxiv, no. 5, 20th May 1914, pp. 308-328.

The author has experimented with species of *Vanessa* and *Pyrameis* on the causation and symptoms of flacherie, and gives the physiological aspects of the question, comparing his results with those obtained in Italy by Verson on silkworms. Certain conditions of the intestine, known as intestinal catarrh, are regarded by the author as different from those which predispose the caterpillar to flacherie. Flacherie and polyhedral disease are regarded as distinct on the basis of the form of the polyhedral bodies, and the symptoms of each are discussed.

# NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

# CONTENTS.

VOL. II. Ser. A. Part 9.—pp. 529-576. SEPT., 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.




*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

**Haenel (K.). Angewandte Entomologie und Vogelschutz.** [Applied entomology and bird-protection.]—*Zeitschr. für angewandte Entomologie, Berlin*, i, no. 1, April 1914, pp. 214-222.

The author says that parasites only increase when their hosts are numerous, so that effective parasitic control begins when the injury is already present, but that birds, which do not confine themselves to preying on given species of insects, will multiply at all times, provided that other conditions are suitable. They, therefore, do preventive work, while the action of parasites is curative. (In a discussion which followed this address, Prof. Schwangart pointed out that useful insects are unceasingly doing preventive work.) Insect pests are usually attacked by parasites when in the larval stage, but birds prey on all stages. Bird-protection is, therefore, an important factor in the biological control of insect pests, though it is difficult to produce exact statistics of the good work they do. In 1912, several threatening infestation centres of *Ips* (*Tomicus*) *curvidens* appeared near Heinersreut, in Upper Franconia, but large numbers of spotted-woodpeckers, tits and nut-hatches prevented any damage being done. In the district of Fischstein, when investigating an attack by *Dendroctonus micans* on felled timber, the author noticed that in wet weather these beetles prevented the water from running into their galleries by placing their bodies outwards half-way through the frass-holes. In this position they were seen to be eaten by a nut-hatch. In the autumn of 1909, the author observed two stretches of copse, adjoining one another, both of which contained nun-moth eggs, one being twice as heavily infested as the other. Bird-protection was carried on in the one, while its less threatened neighbour was left to itself. In 1910, the number of caterpillars in the protected area was only one-thousandth that of the eggs observed, while in the other wood one-tenth of the eggs had hatched out. Dr. Storp reported that in 1908 nun-moth pupae in enormous numbers on the Schnaken estate in East Prussia were attacked by swarms of starlings, which in two or three days destroyed them so completely that sufficient could not be obtained for observation purposes.

**Hodgkiss (H. E.). Susceptibility to Spraying Mixtures of Hibernating Pear Psylla Adults and their Eggs.**—*New York Agric. Expt. Sta., Geneva*, Bull. no. 387, May 1914, pp. 389-418, 2 figs. 3 plates.

Owing to the ineffectiveness of summer spraying as a control measure against the pear psylla nymphs, this station has been investigating the results of spraying the other stages, particularly the hibernating adults and their eggs. The variable results obtained in the past were probably due to the influence of seasonal conditions on the habits of the hibernating adults. It was observed that transformation to the winter adult stage took place in late September or early October, and hibernation occurred on all varieties of pear trees and to a less extent on apple, cherry, peach and plum trees, when these were near infested pear trees ; harbourage was sometimes provided by adjacent outbuildings, fences, etc. Two tables are given showing that these wintering adults do not seek protection until continued freezing temperatures are reached. Thus in the mild winter of 1913 few

(C67) Wt. P86 57. 1500. 9.14. B.&F.Ltd. Gp. 11/3. A

hibernated before the end of December, whilst during mild spells in November and the early part of December of 1910 and 1911, at a mean temperature of about 42° F., large numbers of hibernating individuals appeared and fed on the bud-spurs and tender growth in the centre of the trees ; they neither fly nor hop at these times, which are therefore suitable for spraying. The directions given regarding the spraying of both hibernating adults and eggs are the same as those in a recent paper by the author and Mr. P. J. Parrott [see this *Review* Ser. A, i, p. 127], but full details of the experiments leading to these conclusions are given in the present paper. The importance of spraying at both stages is emphasised ; tables are given showing the state of the hibernating adults and the condition of the pear trees under the varying temperatures between 26th March and 9th May, for four years, from which it appears that the movements of this pest depend entirely on the temperature. Oviposition generally begins a few days after the spring migration from winter quarters by the adults, most of the eggs being laid within two weeks of that date. The results of hatching experiments are also tabulated, and observations over several years suggest the period to be about three weeks.

Schultze (A.). **Die afrikanischen Seidenspinner und ihre wirtschaftliche Bedeutung.** [African silkworms and their economic importance.]—*Zeitschr. für angewandte Entomologie, Berlin,* i, no. 1, April 1914, pp. 223-231.

Indigenous African silkworms [see this *Review*, Ser. A, i, p. 33 and ii, pp. 547-549], which produce "silk waste," are preyed upon by many birds. The chief insect enemy is the ichneumon, *Oneilella formosa.* It has still to be ascertained whether this parasite emerges from the nests of *Anaphe infracta* before or after the host. The author disagrees with Morstatt, who has stated that the former is the case. The Tineid caterpillar, *Metoecis carnifex,* Coq., is found in the nests of *Anaphe* and *Hypsoides,* but only appears to attack dead individuals, on which it feeds.

White (G. F.). **Destruction of Germs of Infectious Bee Diseases by Heating.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. no. 92, 15th May 1914, 8 pp.

In the course of this paper the author gives a summary of 55 experiments, carried out during the last two years, with the object of discovering the amount of heat required to destroy the germs of disease in bees. In these experiments, solutions of diseased material were kept at various temperatures for periods of 10 minutes, and subsequently fed to healthy colonies of bees. The results are grouped into tables, the first dealing with European foul-brood caused by *Bacillus pluton,* in which 13 inoculation experiments are summarised ; these show that at temperatures above 63° C. (145° F.) the germ was rendered innocuous. Experiments with American foul-brood, caused by *Bacillus larvae,* were less conclusive, but the critical temperature is probably less than 98° C. (208° F.). The infecting agent causing sac-brood disease has not yet been found, though it has been shown to pass through the pores of earthenware filters [see this *Review,* Ser. A, i,

p. 186]. The conclusion drawn from 22 inoculation experiments with this disease is that the sac-brood infecting agent is destroyed at a temperature between 131° F. and 140° F. *Nosema* disease is probably the same as that described 57 years ago by Dönhoff, and redescribed five years ago by Zander, who identified the infecting agent as a protozoan, which he named *Nosema apis*. The multiplication and growth of this parasite chiefly occur in the walls of the stomach. Many weak colonies show a high percentage of infected bees, particularly in spring, while even strong colonies often contain a small percentage of individuals thus infected. The geographical distribution of this disease is wide, and extends over Europe, North America and Australia. Details are given of 20 inoculation experiments with *Nosema apis*, and this protozoan is apparently not infective after being heated to a temperature of 57° C. (137·6° F.) or higher for 10 minutes. Beekeepers should in practice use rather more than the minimum temperature given. The melting point of beeswax lies between 62° C. (143·6° F.) and 64° C. (147·2° F.), which temperature would destroy European foul-brood, sac-brood and *Nosema* disease.

**Insect pests and fungoid diseases in Barbados, 1912-13.**—*Agric. News, Barbados*, xiii, nos. 315 and 316, 23rd May and 6th June 1914, pp. 170-171 and 186.

The matter abstracted here forms part of the Report of the Local Department of Agriculture. Experiments in fumigating cotton-seed with sulphur dioxide showed that this gas did not penetrate more than 3 inches into the mass of seed sufficiently to kill the insects experimented with, owing to the absorption of the gas by the outer layers of seed. Hydrocyanic acid gas was also unsatisfactory, the depth of penetration varying from only 2 inches to 10 inches. Carbon bisulphide was efficient, used at the rate of 1 dram per cubic foot of space in the fumigating room, which was kept closed for 24 hours. The order prohibiting the importation of sugar-cane, etc., from countries where the froghopper is known to exist was, on 21st November 1912, made to apply to the island of Grenada, where a species of froghopper (not on sugar-cane) had been reported to occur. The leaf-blister mite spread to the south-eastern portion of Barbados, where it had not occurred in the previous cotton season. Fear of the extinction of the cotton industry does not seem to be well-founded, since in other West Indian islands this mite has been a pest of cotton for the last ten years, and cotton continues to produce profitable crops, owing to careful plant selection (yielding pure strains of early-maturing Sea Island cotton), the picking off of the first-infested leaves, and, in some instances, the complete destruction of the old cotton as soon as the crop is finished, in order to secure an interval of several weeks before the planting of a new one. Plant inspection resulted in the interception of seven species of scale-insects, several species of aphids, and five species of caterpillars not known to occur in Barbados. The root borer (*Diaprepes abbreviatus*, L.) is still being studied [see this *Review*, Ser. A, i, p. 98, and ii, p. 32]. On one estate 69,700 were collected, the greatest abundance being in late October and early November. The discovery in the previous year of the situation in which the eggs were laid made it possible to collect these when the

beetles were most prevalent; 6,138 egg-batches, each consisting of 94 eggs on an average, were collected. The egg-laying period in captivity lasts from 3 to 7 days, the shorter period probably being more usual in the field. The beetles are active at night, hiding by day in the axils of the leaves of sugar-cane and maize and among the leaves of pigeon peas and cassava. The eggs were found fastened between the wind-split tips of cane leaves, rarely in the same situation on maize and never on other plants. The field toad (*Bufo agua*) feeds upon the beetles. When the eggs hatch the grubs drop to the ground, and many are believed to be destroyed by ants. It is suggested that it might be possible to increase the abundance of predaceous ants in the cane-fields and even to introduce additional species. The newly-hatched grubs penetrate into the ground and feed on the cane-roots; later, from December to February, they attack the stem of the cane stool underground, causing the canes to wither as if killed by drought. The root fungus (*Marasmius sacchari*) also produces this result and is often found together with the root-borer. In many cases the fungus is secondary in its attack and in its effect. The practice of digging cane-stumps immediately after reaping the canes is again recommended, but it is stated to have no value if the stumps are left till they begin to dry out, because the grubs leave them and penetrate into the soil, where they may lie dormant for some time. This dormant period has been studied, and grubs have lived in captivity without feeding for periods up to 334 days. This ability on the part of *Diaprepes* grubs has an important bearing on the problem of control, and explains the attacks on young canes when these follow in the same fields without an intermediate crop. No insect parasite of the root borer has been found, in spite of careful search, but two grubs were found attacked by the green muscardine fungus (*Metarrhizium anisopliae*), and trials are being made with this fungus.

The cane leaf beetle (*Myochrous armatus*, Baly) is a potential rather than an actual pest. *Phytalus smithi* is known in Barbados as the brown hard-back, and it has also been called the Mauritius hard-back, since it is a serious pest in that island [see this *Review*, Ser. A, i, p. 28]. Nowell has investigated the life-history and habits of this beetle and its parasite, *Tiphia parallela*, [see this *Review*, Ser. A, i, p. 254] and supplies the following information. The female *Phytalus* deposits her eggs singly at a depth of 4–6 inches in the ground; the life-cycle occupies from 265 to 333 days. The adults are most abundant in May or June; though not much attracted to light they sometimes fly into houses and are caught in light traps. *Tiphia parallela*, is a very efficient parasite of this pest; its life-cycle occupies about 50 days and each female lays about 70 eggs. This *Tiphia* does not seem to be generally distributed over Barbados, as *Phytalus* occasionally appears in numbers without any *Tiphia* being found. The ordinary hard-back (*Ligyrus tumulosus*) is parasitised by *Dielis dorsata* in a similar way, the chief differences being that the sting of the *Dielis* female produces a fatal degree of paralysis in the larva and the *Dielis* egg is deposited on the ventral instead of the dorsal surface.

The cane-fly (*Delphax saccharivora*) is reported to have attacked both old and young canes, but was apparently controlled by natural enemies, principally *Chrysopa* spp. The rust-mite of canes (*Tarsonemus*

*spinipes*) is of general occurrence, but apparently caused little damage. The leaf-blister mite of cotton (*Eriophyes gossypii*) has spread over all the cotton-growing areas and has become a very serious pest. The removal by law of all old cotton before the season for replanting offers, under Barbados conditions, a fair chance of getting rid of it entirely. Cotton plants of the "native" type growing among infested Sea Island show no signs of the presence of the mites. Thrips (*Euthrips* sp.), flea-beetle (*Chaetocnema amazona*) and a red spider (*Tetranychus telarius*) are pests of sweet potatoes, and are generally most troublesome in dry weather. Slips for planting should be fumigated in a tight wooden box by means of carbon bisulphide at the rate of 1 dram to each cubic foot of space. The cassava hawk-moth, (*Erinnyis* (*Dilophonota*) *ello*) severely attacked cassava fields, the plants being completely defoliated over about 12 acres. Four broods of caterpillars were observed, occurring at intervals of 30 days, and it was estimated that there were 8 broods in the season. Spraying with arsenate of lead and dusting with Paris green are effective. The spray contained 4 lb. of arsenate and 50 pints of molasses to every 50 gals. of water, the molasses being added to overcome the water-repelling property of the cassava leaves. Paris green was used at the rate of 1 lb. to 6 lb. of lime. The larvae and pupae are eaten by the Barbados blackbirds (*Quiscalus fortirostris*), the larvae by wasps (*Polistes* spp.) and the moths by the rain bird (*Tyrannus rostratus*). No Tachinid flies or other parasites were observed. The larva of the whitewood moth (*Duomitus punctifer*) were found tunnelling in whitewood (*Tecoma leucoxylon*), sour sop (*Anona muricata*), Barbados cherry (*Malphigia glabra*), the woody stems of *Ipomoea* vines and in ornamental crotons (*Codiaeum* spp.). The COCCIDAE recorded during 1912–13 include :— *Aspidiotus* (*Chrysomphalus*) *howreyi*, Ckll., on agaves, and *Pseudaonidia tesserata*, De Charm., on *Cassia fistula*. Another scale, closely resembling the last-named and probably a new variety, was found on grape vine and *Vitis sicyoides*. It is capable of doing much damage, occurring under the bark and causing great numbers of small swellings. *Chionaspis unilateralis*, Newst., on a palm (*Thrinax*), is a new species. *Coccus* (*Lecanium*) *hesperidum*, L., has been identified as occurring on *Pluchea odorata* and on seedlings of *Sterculia fulgens*. This is of interest, since the original records of *C. hesperidum*, as being abundant and injurious in Barbados and other of the Lesser Antilles probably referred to *Coccus viridis*, while *C. hesperidum* was and is a rare insect. An experimental plot of papaw was severely attacked by leaf-hoppers (JASSIDAE), apparently the same species which occurs on cotton without causing injury. Resin compound checked the attack, but reinfestation soon took place.

DAMMERMAN (K. W.). **De Boorders in *Ficus elastica*, Roxb.** [Borer Pests of *Ficus elastica*.]—*Mededeelingen van de Afdeeling voor Plantenziekten, Batavia*, no. 7, 1913, 43 pp. 4 pls. [Received 2nd March 1914.]

The author gives the following list of borer pests of *Ficus elastica* :— *Batocera albofasciata*, de Geer, and *B. gigas*, Drap., are found throughout Java, and although the damage they do is very serious, they are rarely seen, being nocturnal and hiding themselves in corners

and cracks in the stems or in half-open leaves during the daytime. When at work they make a characteristic noise which has caused the natives to give them a special name. The adult beetles live about 7 months and feed on the leaves to some extent; though they do little damage compared with that done by the larvae. It has been observed that when a beetle bites a Ficus leaf, little or no latex flows, and it would seem that the saliva of the beetle has the property of hindering the flow of latex. The female makes a hole in the bark deep enough to reach the bast layer, and inserts her ovipositor in such a way that the egg is laid upon the boundary between the bast and the wood. The hole made by the ovipositor becomes closed. In 7 or 8 days the larvae hatch, and escape from the egg in the direction of the bore-hole made by the parent's ovipositor. The life-cycle of *B. albofasciata* covers from 3 to 4 months on an average, and there are, as a rule, more than 3 generations in the year; females of the first generation give rise to about 200 individuals, of which about 100 survive, half of them being females. The second generation produces 2,500 females, and it is calculated that in a year, one female may be the progenitor of 125,000 larvae. The larvae of *B. albofasciata* cannot readily be distinguished from those of *B. gigas*. *B. hector*, Dej., a pest of the Coral tree (*Erythrina indica*), is also common in Ficus plantations in Java and Sumatra.

*Epepeotes meridianus*, Pasc., and *E. luscus*, F., are common in Java. The bore-holes of these species are only about half the diameter of those made by *Batocera*. The eggs hatch in 6 to 7 days and the young larvae average only 2·7 mm. in length; when fully grown they are about double this size. The presence of the larva may be known by the brownish black frass hanging from the trees. The author says that these larvae are cannibals, and from an observation on a piece of Ficus wood 18 inches long by 3 inches wide, in which 74 eggs of *E. meridianus* hatched, only 12 adult larvae survived. When the larva has made a burrow in the wood it turns back to the upper layer of the bast, and both species of *Epepeotes* have a habit of making a circular burrow round the entrance of the bore-hole which frequently involves the wood, the adult beetle emerging through an opening in this area. The duration of the larval stage is about 2 months, but depends on the time of year, being short during the rainy season and prolonged during the east monsoon. When fully grown the larvae pass through a resting period.

The author also made numerous observations on *Olenecamptus bilobus*, F., the adults of which eat away the leaves from the undersides, leaving only the midribs. The females lay their eggs in the smaller branches and the bore-holes are barely visible. Both bast and wood are consumed; the life-cycle is short, not usually exceeding 2 months. Adults, bred in captivity, lived about 3 months. The larvae of another borer, *Neopharsalia vagans*, Han., were generally found in dead wood, but also occur in fresh Ficus wood. They are somewhat larger than those of *Olenecamptus*. The weevil, *Aclees birmanus*, Faust, lives between the unopened leaves and eats out the red sheath of the buds, but also attacks older leaves and damages them in the same way as *Epepeotes*. The female bores a hole in the bast with her long proboscis and lays one egg at the end of it, generally selecting a wound or the broken end of a branch. The larva bores an irregular

gallery between the bast and the wood and when fully grown is not more than 15 mm. long. The pupal stage lasts about 10 days and the whole life-cycle about 40.

Other Longicorn Ficus pests include *Apriona flavescens*, Kaup., a well-known pest of Castilloa, *Dihammus fistulator*, Germ., *Pelargoderus bipunctatus*, Dalm., better known as a cacao pest, *Agelasta* sp., *Atmodes irrorata*, F., *Gerania bosci*, F., and two species of *Pothyne*.

Amongst the CURCULIONIDAE, *Mecopus bispinosus*, Web., which mainly attacks dead or dying branches, is also mentioned.

A table of food-plants, other than *Ficus elastica*, is given: *Albizzia* is attacked by *B. hector* and *E. meridianus* *O. bilobus* appears to confine itself to *A. blumei*; *Artocarpus integrifolia* (Jack Fruit) is attacked by *E. meridianus, E. luscus* and *Aclees birmanus*; *Canarium commune* is attacked by *Pelargoderus bipunctatus*; *Castilloa elastica* by *B. albofasciata, E. luscus, Agelasta* sp. and *Neopharsalia vagans*; coffee and Datura by *Dihammus fistulator*. *Eriodendron anfractuosum* (silk cotton tree) by *B. hector*; *Erythrina* (dadap) by *B. albofasciata* and *B. hector*; *Ficus hispida* by *B. albofasciata, E. meridianus, E. luscus, O. bilobus* and *A. birmanus*; *Ficus variegata* by *E. meridianus*; *Mangifera indica* (mango tree) by *E. meridianus, E. luscus* and *O. bilobus*; *Myristica fragrans* (nutmeg) by *B. hector*; *Piper nigrum* (black pepper) by *Pelargoderus bipunctatus*; *Ricinus communis* (castor oil plant) by *D. fistulator*; *Spondias mangifera* (hog plum) by *B. hector*; and *Theobroma cacao* by *E. meridianus, E. luscus, Dihammus fistulator, Pelargoderus bipunctatus* and possibly by *O. bilobus*.

Ficus borers have few enemies, as they are well protected in their burrows. Woodpeckers attack the larvae and crows the adults. From two larvae of *E. meridianus* the author bred specimens of a predaceous Colydiid beetle, apparently *Dastarcus confinis*, Pasc.

Indirect methods are probably of importance in control measures, including careful cultivation and the keeping clean of plantations. The larvae may be cut out or killed with a steel wire, the best time for this being three weeks after tapping and again six weeks later; if delayed longer a large number of larvae will have pupated.

Experiments were made with trap logs consisting of bundles of *Albizzia stipulata, Ficus hispida, Artocarpus integrifolia*, and *Ficus elastica*. *F. hispida* yielded 96 *E. luscus*, 58 *E. meridianus*, 286 other borers and 2 *A. birmanus*; *F. elastica*, 19 *E. luscus*, 11 *E. meridianus*, 116 other borers; *Artocarpus*, 21 *E. luscus*, 16 *E. meridianus*, 96 other borers and 9 *A. birmanus*; and *Albizzia* only 6 borers classed as "other." It is thus evident that *F. hispida* is the best trap wood. The author thinks that the logs used were not thick enough to tempt *Batocera* to lay its eggs. It is important that the trap logs should be set up on end and should not stand longer than 6 weeks, or, if the plantation be seriously attacked by *Aclees birmanus* or *Mecopus bispinosus*, destroyed at the end of a month; the trap logs need only be set up during the rainy season. Nearly all the larvae were killed when the logs were submerged for 48 hours.

Catching the beetles by hand was found to be so successful that the price paid to the natives had to be considerably reduced; this should, however, only be undertaken in the rainy season; experiments made with light traps proved useless.

Insecticides are practically useless either against the beetles or the larvae, and as the Ficus trees are of considerable size, efficient spraying of the leaves and young shoots, to prevent the attack of the beetles, is by no means easy. Spraying a log of Ficus wood with 1 per cent. Paris green did not prevent the beetles from ovipositing on it; twelve larvae being subsequently found in it. Tarring the tapping-cuts is apparently of no avail, as the beetles were constantly found on the tarred spots, but carbolineum produced a better result, possibly owing to its strong odour, and from experiments, treatment of the tapping cuts with 50 per cent. carbolineum will probably suffice to kill both eggs and larvae, the best time to apply the remedy being 3 weeks after tapping. The injection of carbon bisulphide is not practicable as it involves the enlargement of the outer opening in each case.

Cooley (R. A.). **Eleventh Annual Report of the State Entomologist of Montana.**—*Mta. Agric. Expt. Sta., Bozeman*, Bull. 98, Feb. 1914, pp. 123-136. [Received 17th Aug. 1914.]

*Eriophyes pyri*, Pgst., the leaf-blister mite, was the most injurious insect pest of apples and pears in the Bitter Root Valley in 1913, except in orchards in which the strong lime-sulphur spray had been used just before the buds opened. *Rhizoglyphus hyacinthi*, Boisd., the bulb mite, was found in a shipment of imported bulbs, and *Eriophyes padi*, Nal., the plum gall mite, was very abundant in the eastern half of the State. It distorts the leaves of both cultivated and wild plum, and in many instances reduces the fruit-crop. Some injury to sweet peas and clover was caused by the clover mite (*Bryobia pratensis*, Garman), but it attracted most attention as a household pest. *Troctes divinatoria*, F., the book-louse, attacked wheat. The most injurious grasshopper was *Melanoplus bivittatus*, Scud.; autumn ploughing to destroy the eggs and the use of hopperdozers against the young stages were the most effective control measures. *Haplothrips statices*, Holiday, damaged the seed-crop in the heads of red-clover; the chinch-bug (*Blissus leucoptera*, Say) was less abundant than formerly; a swarm of *Lygaeus lateralis*, Dall., occurred in June, but disappeared in a day or two without injuring the vegetation. The false chinch-bug (*Nysius angustatus*, Uhl.), did considerable damage to garden crops, but *Anthocoris melanocerus*, Reut., and *Leucopis griseola*, Fall., were useful, being predaceous on plant-lice. The green apple-aphis (*Aphis pomi*, De G.), was unusually abundant, and in some instances even the fruit was attacked. So many enquiries were received concerning *Aphis brassicae*, L., that a circular was prepared. [See this *Review*, Ser. A, ii, pp. 4–5.] *Pemphigus betae*, Doane, the sugar-beet root-louse, caused more injury than for several years, and in some fields it was estimated that the weight of the crop was reduced by one-third. *Toxoptera graminum*, Rond., was found in several grain fields, but did little damage. The oyster-shell scale (*Lepidosaphes ulmi*, L.), is the most injurious scale-insect in Montana, and during the year attempts were made to ascertain whether two dilute sprays for apple-scab would also control the scale; it was found to be much reduced by such treatment, but the strong

dormant spray is needed to control it completely. Approximately eight tons of Paris green were used against a bad outbreak of the sugar-beet webworm (*Phlyctaenodes sticticalis*, L.), and in nearly every instance the beets were saved. The attack occurred in June, and, as in 1912, the usual August brood of larvae did not appear. Lucerne was also attacked in several parts of the State by this pest. Climbing cutworms (NOCTUIDAE) did considerable damage to young fruit trees, but in one large orchard where they had been abundant in 1912 they were completely controlled by banding the trees with tanglefoot. *Cacoecia* (*Archips*) *rosaceana*, Harris, the oblique-banded leaf-roller, badly damaged the foliage in an apple orchard ; it has also been found feeding on cottonwood. The codling moth (*Cydia pomonella*, L.), is becoming year by year more abundant in Montana than ever, and the Mediterranean flour moth (*Ephestia kühniella*, Zell.), infested flour from Bozeman. *Alsophila pometaria*, Harris, damaged orchards ; the trees should be banded with tanglefoot, applied early in spring, as the females emerge from the ground on the very first warm days. *Hylemyia antiqua*, Mg. (*Pegomyia ceparum*, Mg.), the onion maggot, completely destroyed seedling onions in some gardens, but plants grown from sets suffered less. False wireworms (*Eleodes* sp.) were reported for the first time as injurious to grain, one grower losing nearly one-third of his crop of autumn wheat. The currant fruit weevil (*Pseudanthonomus validus*, Dietz) is probably responsible for nearly one-half the injury formerly believed to have been caused by the currant-fly, *Epochra canadensis*, Lw. Seventy-five sacks of a shipment of flour were found to be infested with *Calandra granaria*, L., and a number of *Cartodere ruficollis*, Marsh., were found in a sample of wheat. Garden crops and potatoes were attacked by the spotted blister-beetle (*Epicauta maculata*, Say), and Nuttall's blister-beetle (*Cantharis nuttalli*, Say) attacked lucerne. *Leptinotarsa decemlineata*, Say, the Colorado potato-beetle, was unusually destructive, and the poplar leaf-folder (*Pontania bozemani*, Cooley) attacked shade-trees. A careful search was made in the most likely part of the State for the lucerne weevil [see this *Review*, Ser. A, ii, p. 294], but although trains from infested territory daily pass through this locality no occurrence in Montana is yet reported.

**State aid in combating vine pests in Luxemburg.**—*Luxemburger Weinztg., Grevenmacher*, ii, no. 7, 1st April 1914, pp. 98–100.

By paying a surcharge of from 2 to 5 per cent., according to their tax-assessment, non-members of the Vinegrowers' Union are permitted to purchase insecticides at the same prices as members. The whole requirements for the year 1914 for combating the various pests may be ordered at once, but the following maximum quantities (approximate) per quarter acre may not be exceeded :—For *Peronospora* : copper sulphate, 26½ lb. ; for *Oidium* : sulphur, 20 lb. ; for the first and second generations of *Clysia ambiguella*, Hb., each : nicotin, 5 lb., copper sulphate, 3¼ lb., soap, 1½ lb. In certain cases, based on tax-assessment, insecticides may be obtained free of charge, or at a reduction.

P. F. **Zur chemischen Bekämpfung des Heu- und Sauerwurms während 1914.** [Chemical control of both generations of *Clysia ambiguella*, Hb., during 1914.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 7, 1st April 1914, pp. 101-103,

The encouraging results with nicotin spray in previous years have led to this method being largely adopted for 1914. With a view to improving the technique, experiments are being made on a total area of 3½ acres, distributed in 10 localities. Seven insecticides are being tested, including a 10 per cent. tobacco extract for which three formulae are given. Dr. Muth's emulsion (nicotin, bisulphide of carbon, petroleum-soap) of which 1 part in 20 of water is employed against the first generation of *Clysia*, and 1 part in 40 of water against the second generation; and the weather-resisting Schachenmühl nicotin, which costs about 1*s.* 7*d.* per lb. at the manufactory. One lb. of the latter is used with 10 gals. of 1 per cent. Bordeaux mixture, and no grubs were seen in the experimental plots where this insecticide was previously used.

Rousseaux (E.). **Le Contrôle des Anticryptogamiques et des Insecticides.** [The control of Fungicides and Insecticides.]—*Jl. d'Agric. Prat., Paris*, 1914, i, no. 14, 2nd April 1914, pp, 431-433.

An account is given of the laws enacted in France to prevent fraud and misrepresentation in dealings with chemicals used as fungicides and insecticides. All dealers in these substances must declare the amount of copper per cent. in mixtures containing copper compounds, and the price is based on this figure. Samples are taken in the presence of witnesses; of four samples taken for analysis one is sent to the buyer, one kept in the analytical laboratory, and two at the manufacturer's to serve, if necessary, for further analyses. Other enactments deal with the precautions necessary to obtain samples, as far as possible identical, in a mixture which may not be homogeneous throughout.

Zschokke (K.). **Bericht über das Auftreten und die Bekämpfung von Rebenschädlingen in der Pfalz im Jahre 1913.** [Report on the occurrence and control of vine pests in the Palatinate in 1913.]—*Weinbau der Rheinpfalz, Neustadt a.d. Haardt*, ii, no. 8, 15th April 1914, pp. 86-90.

After having been reduced in numbers in the hot summer of 1911, both *Clysia ambiguella* and *Polychrosis botrana* were so favoured by the conditions obtaining in 1912 that a large number of winter-pupae developed in the spring of 1913. After the first flight in May a numerous first generation of caterpillars appeared, but a good yield of grapes would still have been possible had the second generation not been very abundant and favoured by the slow growth of the grapes. Control by natural enemies again fell short of expectations. Scratch-brushing and earthing up the stocks gave good results where the vineyards were isolated; sticky racquets were only employed in one instance and proved a success; bait-traps were practically abandoned as being ineffective and costly, and sprays, especially of tobacco-extract, were chiefly resorted to. This was made up of 1 lb. soft soap

and $1\frac{1}{2}$ lb. tobacco-extract (10 per cent. nicotin) in 10 gals. water, and when used even against the second generation, does not impart a bad flavour to the wine. The best results were obtained where both generations were sprayed, but if only one application is made, it should be against the second generation. The best time for this was during 10 days in the second fortnight of July. In the more severely infested districts the yield from treated vineyards was from $1\frac{1}{2}$ to 5 times as much as that from untreated ones. A disadvantage of nicotin spray is its retarding effect on the ripening of the grapes, but it is thought that by reducing the amount of soap this defect may be remedied. It also occupies much time at a busy season, if it is to be effective; preference should be given to winter treatment. *Byctiscus betulae* (*Rhynchites betuleti*), *Otiorrhynchus* sp. and *Sparganothis pilleriana* did little damage. *Cacoecia costana* did not occur. Only three cases of scale infestation were noticed, *Pulvinaria vitis* being probably concerned. *Tetranychus* sp. was injurious in some cases, and nicotin-soap was used against it.

Lesne (P.). **Les Insectes Nuisibles aux Arbres Fruitiers.** [Insects harmful to fruit trees.]—*Jl. d'Agric. Prat., Paris,* i, no. 7, 23rd April 1914, pp. 534-535.

A short account is given of the damage done to pears by the Hemipteron *Tingis pyri*, F., which occurs from May to October, and causes the leaves to turn yellow and fall off before their time. Fumigation with tobacco fumes in an enveloping tent is the best remedy. *Psylla pyricola* on pears is best combated by means of sprays of soap solution and petroleum emulsions or solutions of nicotin; the following formula for a nicotin spray being given:—Water 100 parts by weight, sodium carbonate (Solvay) 100 parts, white soap 200 parts, nicotin (10 per cent.), 1·33 parts. Against *Aphis cerasi, persicae, mali* and *pruni* on the cherry, peach, apple and plum, respectively, an emulsion of petroleum in soapy water is the best.

Chauvigne (A.). **L'Hivernage de l'Eudémis.** [The Hibernation of *Polychrosis botrana*.]—*Rev. Vitic., Paris,* xii, no. 1063, 30th April 1914, pp. 476-479.

The author says that although the life-history of *Polychrosis* has been considerably studied, little is known as to its hibernation, which he investigated in 1911. He found a hole in the cut end of the old wood which had been pruned the previous year, corresponding with the medullary canal of the twig, and on making a vertical section discovered pupae of *P. botrana* at the bottom of the canal just above the next knot. Individuals of the early generation, which finish their life-cycle before the grapes are gathered, hide themselves in cracks and fissures in the vine stocks or the supporting stakes or in the soil. The later ones, which are still active larvae when the grapes are gathered, often pass in considerable numbers into the vats in the press-houses, where they cause anxiety as to their effect upon the quality of the wine; others take refuge like their predecessors, while some seek the cut ends of the twigs as described. In doing this the larva throws out behind it the frass which is produced and stops as soon as it reaches a knot; the burrow is then somewhat enlarged, and a small

quantity of frass is left behind to close the canal. By February the author found that a large proportion of these bore-holes were empty. Though observers in neighbouring districts and in the south had observed the presence of *C. ambiguella* larvae in identical situations, he himself failed to do so in his part of Touraine. In many cases the remains of larval skins of *P. botrana* are to be found in these bored twigs, and the author is inclined to think that they do not always remain in the same twig until the period of pupation, though it is possible that these remains may be those of the preceding summer generation. In any case, whether as larvae or pupae, he regards them as supplying the May flight of moths. He points out that it is obvious that they are thus amply protected against the cold of winter, and he advises vineyard owners to take the greatest care during the process of pruning to cut out all useless wood of the previous year, and to destroy all such prunings at once on the spot, and he thinks that in this way a very large proportion of the hibernating larvae might be destroyed.

Lyne (R. N.). **Rhinoceros Beetle Traps.**—*Trop. Agric., Peradeniya,* xlii, no. 5, May 1914, pp. 353-354.

The rhinoceros beetle, which breeds in decaying vegetable refuse, can be destroyed in inexpensive and easily made traps, constructed as follows :—Round the sides of a hole 4 feet square and 4 inches deep a wall of bricks or stones about 14 inches high is built ; the enclosure is then filled with small pieces of dead or decaying coconut stems, leaves and other vegetable rubbish, and covered with a thin layer of soil ; the whole should be watered frequently and covered with palm leaves to keep the trap damp ; the traps may be placed about 100 yards apart and can be used as refuse pits.

At the Peradeniya Experiment Station two such traps were made in December 1913, and when examined in April 1914, each contained about 100 larvae. At Maha-iluppalama, 150 larvae were captured in one trap. Where labour is cheap the larvae are best killed by hand, but they may also be destroyed by carbon bisulphide poured into holes made with a crowbar [see this *Review*, Ser. A, ii, p. 30]. Dr. Friedrichs, who is at present studying this pest in Ceylon, has found that by means of these traps the natural enemies may be collected and determined [see this *Review*, Ser. A, ii, pp. 26–28]. Even in a clean plantation the author thinks that traps may always be usefully employed, but should not be left longer than two months.

Rutherford (A.). **The Mango Weevil.**—*Trop. Agric., Peradeniya,* xlii, no. 5, May, 1914, pp. 410-411.

The mango weevil (*Cryptorrhynchus mangiferae*, F.) is widely distributed in India, Ceylon, the Philippines, Madagascar, South Africa, Hawaii and elsewhere. A correspondent of the author's states that in Labuan only about 10 per cent. of the mangoes are edible, owing to the attacks of what is probably this species, and that the insect seems to be spreading there. From one stone two adult weevils were obtained, the pulp of the fruit being partially rotten, and in the side of the stone there was a hole with blackened edges, the contents of the seed being reduced to a black mass of frass. As Green

has obtained a pupa from the stone, it is evident that in Ceylon the insect passes through all its stages—egg, larva and pupa—in the seed, though according to Lefroy, this insect in Florida pupates in the soil. As the weevils remain, even as adults, for a time in the seed, the former condition affords a better opportunity for their collection and destruction, but also increases the danger of the pest being distributed. Fumigation does not appear to be a certain method of killing the larvae in the seed, and therefore all fallen or infested fruit should be destroyed. The author also suggests that spraying at intervals with arsenate of lead (2 lb. to 50 gallons of water) would poison the weevils, which are not known to have any other food-plant.

RUTHERFORD (A.). **The Bean Fly** (*Agromyza phaseoli*, **Coq.**)—*Trop. Agric., Peradeniya*, xlii, no. 5, May 1914, pp. 411-413.

In Ceylon, when *Agromyza phaseoli*, Coq., is present, the bean crop is often a complete failure. A recent correspondent informed the author that out of over 600 seeds planted only 20 plants were obtained. The bean in question is the cherry bean (*Vigna sinensis*), known locally as " Me-karal " or " Wanduru-me." Peas are also said to be attacked. In Australia this fly attacks French, Lima, and Madagascar beans, cowpeas and *Phaseolus* sp. The author has reared *A. phaseoli* from green gram and black gram, and although growing in neighbouring plots the former was the worse attacked. Several Chalcids have been bred from infested material by the author. Referring to an article by Jarvis [see this *Review*, Ser. A, ii, p. 18] the author says that the rooting up and burning of plants has the disadvantage of destroying any parasites that may be present. A cage provided with a covering of fine muslin would permit the parasites to escape, while retaining the flies.

MORRILL (A.W.) **Grasshoppers.**—*Arizona Agric. Expt. Sta., Tucson, Timely Hints for Farmers*, no. 104, 1st May 1914, 1 fig., n. p.

Nearly all Arizona crops are subject to grasshopper attack, but lucerne probably suffers the greatest total loss. In the control of grasshoppers, all stages—egg, nymph and adult—should be given attention. For the wholesale destruction of these pests in lucerne fields the hopperdozer is recommended. This consists of a shallow elongated pan with a high back-shield arranged for dragging across the fields for the collection of the hoppers. The pan is of galvanized sheet iron and divided into compartments, each of which when in use contains water with coal oil on the surface. The shields and sides are preferably made of a smooth cloth, such as oil cloth, and the runners may be waggon tyre, iron or wood, or the hopperdozer may be provided with small wheels. A figure, with measurements, is given of a large example to be drawn by two horses. Small hopperdozers, which can easily be drawn by two men or boys, can be constructed more cheaply, but the author points out that the comparatively low back is a weak feature, since too many of the hoppers would fly or hop entirely over it; £2 8*s*. 6*d*. is the approximate cost of the large hopperdozer which is figured, the back of which is 4 feet in height. This apparatus is best used before the insects have reached the winged stage, and immediately after the hay crop is cut and stacked. When the lucerne is six inches

high or more the runner may be made higher, or, preferably, wheels may be used to raise the pans higher from the ground. The author mentions "Poisoned Bran Mash" and "Griddle Mixture" [see this *Review*, Ser. A, ii, pp. 518-519], and says that, according to experiments conducted in Kansas, the effectiveness of the former may be increased 25 per cent. by the addition of three lemons, chopped fine. Where enough poultry and turkeys are available they are more successful in controlling these pests than poisoned baits.

The military grasshopper is troublesome in the Sulphur Spring Valley, especially as a pest of beans. This insect breeds in the desert surrounding cultivated fields, and is usually first found feeding on mesquit leaves. Autumn and winter destruction of the eggs, except in rare cases, is impracticable, and poultry will not attack the grasshoppers. These insects crawl up tree-trunks, fence-posts and poles at night, and by driving stakes at intervals of a few feet along rows of crops the insects may be destroyed by hand early in the morning before they start to feed. The digging of trenches and post-holes [see reference above] is also suggested.

BERNES (J.). **La Culture de l'Oignon dans l'Agenais.** [The culture of onions in Agenais (Lot-et-Garonne).]—*La Vie Agric. Rur., Paris,* ii, no. 20, 18th May 1914, pp. 559-564.

In the neighbourhood of Agen onions are cultivated on a very large scale, and the total area under this crop in the district is about 550 acres, yielding annually about 5,000 tons. After describing the methods of cultivation, the author says that the crops are subject to a variety of pests, including mole-crickets and the larvae of *Melolontha,* which often do very serious damage to the seedlings, but which are controlled by an injection of bisulphide of carbon into the soil, at the rate of ten grammes to each hole at intervals of twenty inches. The cleaning of the soil at the end of June in hot, dry weather destroys a certain number of eggs of mole-crickets and cockchafers, but the best remedy against the former is the use of small trap-heaps of manure, kept moistened with water. *Hylemyia antiqua* (*Anthomyia ceparum*) is the cause of a large amount of damage to the bulbs, which rot in consequence of the attacks of the larvae. "*Tinea aillela*" [*? Acrolipia assectella*, Z., or *Polychrosis bicinctana*, Dp.] lays its eggs upon the leaves and the larvae destroy the parenchyma.

The author recommends pulling up and burning all attacked bulbs, and burning all sweepings and rakings, which should not be thrown on the manure heaps; the rotation of crops, neither onions nor any liliaceous plant being grown on infected soil for at least three years; spraying with Bordeaux mixture in the event of the leaves being attacked.

TUCKER (E. S.). **Report on Entomology**—*26th Ann. Rept. Agric. Expt. Sta., Louisiana State Univ., 1913, Baton Rouge,* 1914, pp. 26-29. [Received 20th July 1914.]

A grave menace in the form of the cottony cushion scale (*Icerya purchasi*) was discovered near New Orleans; orange-growers were instructed how to combat the pest and it was successfully controlled. Owing to the dangerous nature of the scale, its spread, if permitted to extend beyond the bounds of control in Louisiana, would inflict

a serious blow upon the agricultural interests of the State. The discovery that it thrives on pecan, mulberry and a number of previously unrecorded host plants makes it especially dangerous; should it gain a hold on cypress and pine, on which it is said to live, the timber regions of the State would be endangered.

The southern corn root worm (*Diabrotica 12-punctata*) has been studied, on account of its prevalence in various sections of the State during the spring of 1913. The discovery of larval borings in potato tubers revealed a new habit of the pest.

Tartar (H. V.). **Chemical Investigations on Lime-Sulphur Spray.**—*Oregon Agric. Expt. Sta., Corvallis*, Research Bull. 3, March 1914, 28 pp.

Lime-sulphur is, perhaps, one of the most extensively used insecticides, and there is a very large amount of literature dealing with the methods of preparation. The number of formulae and processes of preparation is also very great, and when carefully considered the results of its use do not show that uniformity which might be expected. It may appear to be a simple matter to boil together, for a given time, given weights of lime and sulphur in a given quantity of water, but as a matter of fact the resulting products may vary very considerably in chemical composition owing to differences in the quality of the lime, the physical condition of the sulphur, the exact time of boiling, and other variable conditions. Since what is required for an efficient spray is a compound of more or less definite chemical constitution, the rough and ready methods generally adopted do not result in a uniform product.

R. W. Thatcher (Bull. 76, Agric. Expt. Sta., Pullman, Wash., 1906) worked out the composition of a number of lime-sulphur solutions, either commercial or prepared by formula, and he arrived at these conclusions:—

The lime-sulphur wash contains two soluble compounds, namely calcium pentasulphide and calcium thiosulphate. The relative amounts of these present in the sprays prepared by any of the common formulae are practically the same, regardless of the proportions of ingredients used in the boiling, except in cases where blue vitriol is added to the mixture. The amount and proportions of these two compounds is not influenced by the presence or absence of salt in the mixture. The addition of copper sulphate to the mixture simply resulted in the removal of an equivalent amount of the pentasulphide sulphur, forming an insoluble copper sulphide, which was probably of no value whatever as an insecticide. He was also of the opinion that when the lime-sulphur was sprayed on to the trees the calcium pentasulphide decomposed very rapidly under the influence of the atmosphere and liberated large quantities of very finely divided sulphur, which in some manner, not definitely determined, acts as a powerful insecticide towards scale-insects; that later the calcium thiosulphate also decomposes, slowly liberating more free sulphur and forming calcium sulphite, which probably also possesses insecticidal properties. Thus the measure of the immediate effectiveness of the spray is the amount of sulphur as pentasulphide which it contains, whilst the calcium thiosulphate is responsible for the well-known, long-continued insecticidal effect.

Incidentally he was of opinion that the so-called Piper 1 : 1 : 4 formula, that is to say, the proportion of 1 lb. of lime and 1 lb. of sulphur to 4 gals. water, costs from one-half to two-thirds less per gallon than do the washes prepared by other formulae in common use, and that the cost of the efficient sulphur in solution is also less in about the same proportion. The Piper formula contains lime in excess of the amount required to combine with the sulphur used, but this lime is present in the wash as " whitewash," and serves to render the spray visible on trees and so aid in thoroughness of application.

The author points out that it is by no means an easy matter to determine with anything like accuracy the chemical constitution of a lime-sulphur spray, and as this has been accomplished by himself and his colleague at the cost of a large amount of labour, he deals with it in detail and discusses at considerable length the very important question of the nature of the calcium polysulphide produced, and also the effects of the time of boiling upon the amount produced, as well as on its composition. He further discusses the effect of the carbon dioxide of the atmosphere in decomposing the diluted solution when sprayed upon the tree, and found that when pure $CO_2$ was passed through the solution a large quantity of sulphuretted hydrogen ($H_2S$), apparently as much as if some strong acid was used, was developed. Further experiments were made by passing air through the diluted lime-sulphur, and although the quantity of sulphur precipitated and the quantity of $H_2S$ given off was relatively small, there is no doubt that something of this kind must be reckoned with in the practical use of the spray.

The author discusses in detail the reaction which takes place between sulphur and calcium hydroxide in aqueous solution, and quotes the experiments of other workers who have investigated this matter. He then deals with the difficulties of determining separately the various products formed, namely, calcium pentasulphide, tetra-sulphide, thiosulphate, and sulphite. All these compounds are readily soluble in water, with the exception of the sulphite, which is relatively insoluble. The average of seven lots of solution prepared gave the following results per 100 cc.:—Specific gravity, 1·287 ; lime compound as polysulphide, 11·29 ; as thiosulphate, 1·13 ; as insoluble sulphite (estimated), 4·51 ; sulphur as polysulphide, 30·67 ; sulphur as thio-sulphate, 1·29 ; sulphur as insoluble sulphite, 2·56. In the seven specimens analysed the ratio of lime (CaO) to sulphur required was 1 : 2, and the author thinks he is justified in saying that this is the proportion of lime to sulphur which reacts in the preparation of the more concentrated commercial lime-sulphur solution. He regrets that he had no opportunity of examining more diluted solutions prepared under commercial conditions, but quotes Thatcher and Van Slyke to the effect that the ratio of lime to sulphur would, in this case, be somewhat greater than 1 : 2, and that in some cases it might perhaps be as high as 1 : 1·25 ; he says that this theoretical basis will not apply exactly to the preparation of small amounts of solution, say 150 gallons or less, where oxidation of the polysulphides occurs to a considerable extent through contact with air.

The author then proceeds to discuss the valuation of lime-sulphur as an insecticide. He says that in many cases the total lime contained, the total sulphur contained, and the specific gravity only are ascer-

tained, and that entomologists and horticulturists making field experiments generally use the gravity test only. He points out that the matter of real importance to the agriculturist is the more or less correct determination of those constituents of the spray which are really insecticidal, and that mere gravity is of little or no value for this purpose. Shafer has shown that with scale-insects the calcium polysulphides present in the solution soften the so-called wax about the margin of the insect and on drying cause it to stick to the plant; in experiments made, the insects were stuck down tightly enough to cause also the death of the young by sealing them under the scale-cover of the mother. Shafer's work strongly indicated that perhaps the principal insecticidal effect upon scale-insects is its great power of absorbing oxygen, thus causing the treated insects to suffer from an insufficient supply of this element. Shafer further showed that, contrary to frequently expressed opinion, sulphur dioxide is not produced in appreciable amounts from sulphur deposited from the spray, except at temperatures much higher than those generally prevailing in orchards, and he does not think that this evolution of sulphur dioxide can be regarded as having any real importance in increasing the insecticidal value of the spray.

The author's own work and that of his colleagues clearly indicate that the principal insecticidal constituents are the calcium polysulphides. Experiments with San José scale have shown that calcium thiosulphate has little or no insecticidal properties. Shafer and Wellington have arrived at similar conclusions. It has long been known that certain insects are killed to some extent by dry sulphur alone, and for more than a quarter of a century dusting with dry sulphur has been used in California against the almond red spider. Authorities are quoted to show that there is considerable justification for faith in this application of dry sulphur. It has also been suggested that hydrogen sulphide, which is poisonous to insects, may be liberated from lime-sulphur, but experiments carried out in the laboratory showed that the quantity produced is so exceedingly small that it can hardly be of any consequence.

The insecticidal properties of lime-sulphur are thus considered to be due to:—(1) Its power of absorbing oxygen; (2) its ability to soften the newly secreted wax on the margins of scale-insects; and (3) the amount of free sulphur formed in its decomposition.

The combination of oxygen with the moist polysulphides is very rapid, but combination with the thiosulphates is very slow, too slow in the author's opinion to make this compound of any consequence as an insecticide, and experiments made at the Station indicate that calcium sulphite has practically no insecticidal effect whatever upon the San José scale. The author suggests that what he thinks might be expressed as "oxygen number," that is to say, the number of grams of oxygen absorbed by 100 grams of lime-sulphur, would be of great value to agriculturists as a standard of efficiency. He also suggests that a number, which might be called "available sulphur number," should be used, this term meaning sulphur deposited expressed as a percentage of the original lime-sulphur solution. He says that no chemical explanation can be given of the undoubted softening effect of polysulphides upon the waxy secretion.

A very full bibliography of the subject is given.

**Analyses of materials sold as insecticides and fungicides.**—*New York Agric. Expt. Sta., Geneva, N.Y.*, Bull. 384, April 1914, 20 pp.

These tables give the guaranteed percentage of the active principle and the percentage actually found in the various brands tested from samples taken in stated localities. As a general rule, the guarantee was materially exceeded, only in a few cases did the contrary obtain, and then but to a slight extent. The following figures are those actually found on analysis :—In Paris green the percentage of arsenious oxide varied from 56·12 to 57·19 ; that of copper oxide from 29·06 to 30·84 ; that of water-soluble arsenious oxide from 3·09 to 8·39. In lead arsenate the arsenic oxide varied from 11·71 to 18·89 per cent., and (in the case of dry lead arsenate) from 22 to 31 per cent. ; the lead oxide from 30·59 to 44·89 per cent. and from 43·74 to 64·40 per cent. ; the water-soluble arsenic from 0·24 to 1·35 per cent. and from 0·29 to 1·57 per cent. In a Bordeaux-Paris green mixture the percentage of copper was 4.87 and that of arsenious oxide 0·22 per cent. ; whilst in a mixture of Bordeaux (dry) and Paris green these figures were 19·22 and 16·48 respectively. In Bordeaux and lead arsenate mixture the percentage of arsenic oxide varied from 1·30 to 13·27 per cent. ; that of lead oxide from 2·73 to 26·23 ; that of copper from 1·77 to 5·65 per cent. ; and that of water-soluble arsenic oxide from 0·11 to 0·43 per cent. In lime-sulphur solution the percentage of sulphur in solution varied from 13 to 26·34 per cent. ; the density ranging from 21·6 to 36·5 degrees Beaumé. In soluble sulphur compounds the soluble sulphur present varied from 58 to 58·42 per cent. In mixtures of soluble sulphur and oils the amount of soluble sulphur varied from 4·95 to 31·81 per cent. In nicotin preparations the percentages of nicotin varied from 0·89 to 44·94 per cent. A table of soap emulsions is given, and in one of hellebore the percentages of ash range from 9·63 to 21·45 per cent. In a table of miscellaneous materials and mixtures the principal features of these compounds are mentioned.

Smith (G. R.). **Distintos métodos para la destrucción de los insectos.** [Various methods of insect destruction.]—*Bol. Minist. Agric., Buenos Aires*, xvii, nos. 3 & 4, March & April 1914, pp. 342-363, 8 figs., 2 tables.

This paper gives a popular and general account of the several methods of insect control now practised. The principal insecticides are described, and various common pests, their injury and control, are tabulated.

Lüstner (G.). **Die Nahrung des Ohrwurmes** (*Forficula auricularia*, **L.**) **nach dem Inhalt seines Kropfes.** [The food of the earwig as shown by the contents of its crop.]—*Centralblt. Bakt. Parasit. & Infektionskrankheiten, Jena*, xl, nos. 19-21, 4th April 1914, pp. 482-514.

As the earwig is a night-feeder it is difficult to ascertain its food-material by observations in the open, whilst the numerous laboratory experiments on the subject have always been subjectively influenced by the insect's choice being limited to the material provided. The results obtained by over 30 workers are summarised by the author, who points out that the uncertainty has increased with the number of tests. To determine the food of the earwig it is necessary to

examine the contents of its crop. Seven batches, comprising 162 earwigs, were thus investigated, and the conclusion arrived at is that these insects are universal feeders. Normally, they feed on dead portions of plants, and on fungi such as *Capnodium*, etc., but when a favourable opportunity occurs, living leaves and flowers are attacked. The crops of 19 out of 20 individuals placed on dahlias were filled with parts of their leaves and flowers, so that it is quite correct to consider the insects as pests of these plants. Only dead animal matter appears to be consumed, so that earwigs are non-beneficial.* The proportion of such animal food is small and only seems to be present where other food is not to be had. In general, the earwig may be held to be a harmless insect which only needs combating in special cases. So far, its behaviour as regards ripe fruit and in the vineyard and field has not yet been investigated by the author.

MICHEL (E.). **Note sur certains Vers-à-soie sauvages du Congo Belge.** [Note on certain indigenous silkworms of the Belgian Congo.]—*L'Agron. Trop., Uccle*, vi, no. 4, April 1914, pp. 33-45, 6 pls.

The silk-producing caterpillars of the genus *Anaphe*, which are abundant in many parts of West Africa, Uganda and Natal, assemble together in considerable numbers just before pupation and spin a common nest within which each pupates in its own cocoon. These silk nests are to be found all over the Congo, but the natives seem to be entirely unaware of their utility. A company has now been formed, with the sanction and under the direction of the Government of the Belgian Congo, for the purpose of collecting the nests in certain districts and for the methodical cultivation of these indigenous silk-worms. The silk produced by the genus *Anaphe* is specially adapted to the silk-waste industry, for the manufacture of velvets, plushes, and the fabrics for neckties, umbrellas, sewing-silk, etc., and it is possible that it might prove useful in the manufacture of fabric for the envelopes of balloons. For some time past this industry has extended considerably and although the silk-waste produce of *Bombyx mori* is of excellent quality, it appears, according to Prof. Lehmann, of the Royal School of Spinning and Weaving at Crefeld, that the silk-waste produce of *Anaphe* is superior to this in resistance and elasticity. It is, however, not so brilliant, but it is considered probable that a remedy can be found for this defect. Seeing that the moths are indigenous and that no capital is required for breeding them, at all events at present, as it is a mere question of collecting the nests, the industry would appear to be commercially attractive. Should it be found necessary or desirable to undertake the artificial rearing of these indigenous silk-worms, it could be done in Africa without any difficulty and with a comparatively small outlay.

Experience has shown that the industrial value of the silk-waste ("schappe") derived from the cocoons or the nests which the perfect insects have left, is not in any wise diminished ; this, as is well known, is not the case with the cocoons of *Bombyx mori*. There is no necessity, therefore, to kill the pupae of *Anaphe* as is the case with *Bombyx mori*.

* [There are various records of earwigs eating living insects ; for their beneficial destruction of *Depressaria* pupae, *cf.* this Review, Ser. A, i, p. 43.—ED.]

There are several species of *Anaphe* found in the Congo, of which *A. infracta* and *A. venata* are most widely distributed, and from a commercial point of view the latter is the most important. The adults emerge twice a year, in September and in January. The life of the perfect insect is very short; the males die soon after pairing and the females soon after oviposition, which lasts five or six days. The female does not fly far from the place of emergence and is generally to be found either on the nest or on the bush or tree to which it is attached. The eggs are generally laid on the lower surface of the leaves on which the larvae feed, and are arranged in heaps of 200–300, being covered by the female with a protective layer of hairs from the end of her abdomen. When the caterpillar has reached the age of fifteen days each segment of its body bears a row of fine whitish hairs or spines which are very easily detached and break at the slightest touch; on being handled, these hairs produce a most intense and intolerable itching. So far as the author is aware, the larvae moult six or possibly seven times. They do not move about much during the day, and avoid bright light, feeding generally at night. They have been taken on several species of plants, namely, *Cynometra alexandri*, *Triumfetta macrophylla*, *Albizzia fastigiata*, *Macrolobium dewevrei* and *Afromorsia elata*; but *Bridelia micrantha*, which is exceedingly widespread over the whole Congo area, appears to be the food-plant *par excellence*. The life of the caterpillar is about six or eight weeks.

The nests of *Anaphe infracta* are of a rusty red and are composed of layers as follows: the external envelope resembles a sheet of paper, varying in thickness from tissue to heavy brown paper; it is sometimes very fragile and sometimes fairly tough. The next layer is composed of several layers of silk (ten to fifteen), and when cut across, these may be opened out almost like leaves of a book. The third envelope, also formed of several layers of silk, but closely attached to one another, has very much the texture of parchment; this envelope is hard and exceedingly unpleasant to handle, as it contains the urticating hairs of the caterpillars.

The nests of *Anaphe venata* are coffee-coloured and may even be the colour of milk; they have only one envelope, and cause no irritation when handled.

*Anaphe* has several enemies, and perhaps the most important are the natives themselves, who are very fond of eating the caterpillars and chrysalids roasted. Three species of birds feed on the caterpillars, namely, *Chrysococcyx cupreus*, *Pycnonotus layardi* and *Motacilla campestris*. These birds do not appear to be in the least affected by the stinging hairs. Of insect pests, a Chalcid, *Telenomus gowdeyi*, parasitises the eggs and is itself parasitised by *Pleurotropis telenomi*. The chrysalis is attacked by an Ichneumonid, *Oneilella* (*Cryptus*) *formosa*, which is very common in tropical Africa. The female bores through the nests and cocoons with its ovipositor and lays its eggs in the body of the pupa. According to Küller the perfect Ichneumons emerge after the moths. Schultze says that *Oneilella* lays its eggs upon the caterpillars.

The principal food-plant of *Anaphe*, *Bridelia micrantha*, is a euphorbiaceous plant which is found in abundance in the Lower Congo and is cultivated in Uganda by the African Silk Corporation for rearing these

silkworms. The plan adopted is to attach nests containing living caterpillars to the plants, to wait until the perfect insects have emerged, and then to collect the nests. It is very important that the plantations should be carefully watched to keep away predaceous birds. The author thinks that there is great scope for the cultivation of *Anaphe*, and suggests that the natives should be carefully instructed to collect the nests in a proper manner, for if they are paid a fair price the foundations of an important industry might well be laid.

In order to avoid injury to the skin, the nests of *A. infracta* should be manipulated under water and workpeople should wear a mask to protect the mouth and eyes, as the irritation produced by the broken hairs is very serious. If no water can be obtained, and it is necessary to treat nests dry, the author recommends that the operators should wear a veil and smear their hands and arms thickly with soap or some greasy substance. The exterior layer of the nest furnishes the most valuable silk, the next quality is supplied by the parchment envelope and that of the cocoons is of the least value.

The author says that care must be taken in storing the raw silk for export, as it is seriously attacked by rats, mice, ants, etc. It must also be kept thoroughly dry, because it has been found that the moisture will penetrate the whole mass and render it useless for commercial purposes.

AZÉMARD (—). **Les Insectes parasites des Arachides au Senegal.** [Insect pests of the ground-nut in Senegal.]—*L'Agron. Colon.*, *Paris*, i, no. 10, 30th April 1914, pp. 106-110.

Ground-nuts, while still growing, are attacked by termites, especially a week or two before harvest, and by the larvae of an Elaterid beetle, though really serious damage is confined to very restricted areas. When stored, various insects attack them ; of these the most important seem to be the larvae of the Pyralid moth, *Plodia interpunctella*, and of the Tenebrionid beetle, *Tribolium confusum*. Termites pierce the outer covering or pod and may or may not do further damage ; in some cases the entire nut is eaten away, while in others the nut itself remains intact or is only slightly damaged. The Elaterid larvae attack the nut in exactly the same way. Fortunately these pests are confined to a limited area of Senegal, and the proportion of damaged nuts is small. *Tribolium confusum* is common in Senegal and multiplies abundantly in the heaps of stored nuts. In 1913, from February to July, it caused damage to the extent of 6 to 30 per cent. in various consignments placed under observation. Fumigating with carbon bisulphide and with hydrocyanic acid was attempted, but without much success. The adults of *Plodia interpunctella* lay their eggs among the stored nuts, attacking particularly those which have suffered in the open from termites or Elaterids. Neither *T. confusum* nor *P. interpunctella* cause really serious damage, but it is desirable nevertheless to eliminate them where possible. Getting rid at once of nuts that have been attacked in the open will diminish the breeding facilities of the insects. The saw-toothed grain beetle, *Silvanus surinamensis*, is also to be reckoned as a pest, though as a rule the damage done by it is small.

The author says that thorough screening and winnowing before baling or storing is a simple and excellent means of getting rid of the pests, or reducing them to negligible proportions. Such methods would, it is believed, have better results than the more costly method of fumigation. The amount of rubbish among the nuts, when received from the interior, is very considerable.

DEGRULLY (L.). **Memento pour le traitement du Mildiou et la preparation des Bouillies Cupriques.** [A note on black-rot treatment and on the preparation of cupric sprays.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 15, 12th April 1914, pp. 449-459, 7 figs.

The author deals very fully with the proper preparation of the sprays, and lays stress on the necessity for careful dosing, selected material, and timely, persistent, application. The following is a practical installation for making and distributing Bordeaux mixture :—A ferro-concrete tank is fixed to a wall at such a height that a barrel mounted on cart-wheels may be drawn up below and in front of it. Above it is a water-tank of a capacity of 800 cubic feet which supplies the water necessary for the spray solutions. The tank is divided into four separate divisions, each a cube of 28″ side-measurement and provided with an outlet at bottom-level for the convenient drawing-off of its contents. A ladder placed against the tank gives access to a wide ledge which runs along its face and affords ample standing room. Three of the compartments are used for dissolving copper sulphate, the chemical being placed in a basket or bag half-way submerged and kept suspended by a stick laid across the top of the container. The fourth compartment is used for the lime. The procedure is as follows :—In each of the three compartments 44 lb. of copper sulphate are dissolved in 66 gals. of water. The contents of one compartment are then run into the barrel below. (This barrel has a capacity of 40 cubic feet.) The compartment is then rinsed out with, say, 22 gals. of water, which are then run into the barrel. The 66 gals. of milk of lime contained in the fourth compartment are then run into the barrel and the compartment is well rinsed out with a quantity of water sufficient to fill the barrel up to 220 gals. The actual mixing of the spray solution is done by the shaking during cartage to the field of operations. The milk of lime should contain 225 parts (224·9 exactly) of good quality " fat " lime to every 1,000 parts of the copper sulphate used.

MOREAU (L.) & VINET (E.). **La lutte contre la Cochylis. Insecticides et insectifuges. Leur emploi dans les moyens et petits vignobles.** [The control of *Clysia ambiguella*. Insecticides and insectifuges, and their employment in small and medium-sized vineyards.]—*Rev. Vitic., Paris*, xli, no. 1059, 2nd April 1914, p. 369.

Experiments made during the last seven years lead the author to believe that, in small vineyards where the supply of labour is not a difficulty, the most accurate and efficient results are obtained by using internal insecticides. Insecticide sprays are, however, only of practical use against the first generation of *Clysia*. Against the second, dusting with insectifugal powders must be resorted to, and although this method is less efficient than the former one, it is a useful complementary. Internal insecticides are essentially preventives and

their effect is not always tangible, but experiments will determine their value. In the author's hands, lead arsenate gave constantly favourable results over a period of seven years, and its efficacy increased as more knowledge regarding date and mode of application was acquired and applied. In 1913, the percentage of mortality attained was 94·2. Regional differences alone cannot account for those reported cases where the percentage was zero. Nor can it be said that in the experiments here referred to only sparsely infested plots were treated, for the trials were made during seven years. While the lack of abundant skilled labour prevents full use being made of arsenate of lead on large estates, this objection but rarely applies to small vineyards. In the experiments, wine-traps were used as indicators. They were placed in position on the 28th April 1913, and the first few captures early in May were disregarded, as some few individuals always emerge prematurely. About the 16th May catches began to become abundant and this date was used as a basis, the first application of spray being made three weeks later on the 6th June. This was followed by a second application ten days later, on the 16th June. The mortality on the treated portion of the plot reached 94·2 per cent. in the case of *Chenin blanc* vines and 68·0 per cent. in the case of *Gamay* vines. This proves that the *Gamay*, a vine of rapid growth, requires a different date of treatment from the *Chenin blanc*. In a vineyard where many different species of vine are grown the grower has a longer period at his disposal in which to apply treatment. The author states that four labourers, experienced in this work, can cover 2½ acres in a day, if both sides of each row of stocks be carefully sprayed. This is for the first application; the second one requires a little less time. This means that in favourable weather and using the plant now available, four men can thoroughly spray a vineyard of 16 acres planted with four different species of vines. For instance the following species of vines should be sprayed in the order given :— *Pinot Chardonnay*, *Gamay*, *Cabernet Sauvignon* and, lastly, *Chenin blanc*. Even in this case a few days would still remain over in the interval between the first and second treatments, so that the first treatment might be postponed a couple of days in case of wet weather. It should be noted that when rain falls some hours after spraying is completed, the spray has had time to dry and is not easily washed away or rendered ineffective. In vineyards that are surrounded by others it is necessary to practise control against the second generation of *Clysia* if the benefit due to the above treatment is to be reaped. Insecticide sprays are impracticable and recourse must be had to insectifuge powders. Seven applications are theoretically necessary. They should be made during the flight of the moths, at intervals of four days, beginning on the 17th July. The powder is made up of one-third precipitated sulphur and two-thirds hydraulic lime. In actual practice only three or four applications are usually possible, but they will give satisfactory results if made during the period of maximum intensity of flight. The foregoing mixture has been proved to be efficacious against *Clysia*; it is cheap and is also of use against *Oidium* and other pests which appear in July. The combination of the insecticide sprays and insectifuge dusting reduced the percentage of injury by 60·8, whereas dusting alone only reduced the percentage by 26·3. The author believes that the powders act by impeding

oviposition. Besides counting the larvae in spring and the injured grapes in summer, the grape yield was checked in the same treated and untreated plots. The figures work out at an increase of about 2,565 lb. of grapes per acre in the case of the treated vineyards. This means an extra four casks of must, at least, for the treated grapes were larger and finer than the others. Taking the vineyard as a whole, it was found that treatment about doubled the output. Careful owners of small vineyards have therefore an efficacious method of control at their disposal and the owners of large vineyards can also profit by it in some measure.

Degrully (L.). **La lutte contre les insectes.** [Combating insect pests.] —*Progrès Agric. Vitic., Montpellier*, xxxi, no. 16, 19th April 1914, pp. 487-490.

In vineyards, both the vine flea-beetle (*Haltica ampelophaga*) and the leaf-roller of the vine (*Sparganothis pilleriana*) may be easily controlled by arsenicals, but *Clysia ambiguella* and *Polychrosis botrana* remain difficult to combat. The use of arsenicals is limited to spring. Once the grapes are formed, nicotin alone can be used. Summer treatment is hampered by the luxuriance of foliage and by the difficulty of determining the proper moment for action. According to many workers the latter coincides with the period of flight, but this is somewhat protracted, so that a proportion of insects is bound to escape even where the efficiency of the insecticide reaches 100 per cent. *Haltica*, *Clysia* and the leaf-roller are controlled by the same formulae, which are as follows :—

*Arsenate of lead.* In regions with a damp climate, about 3 oz. of arsenate of soda should be allowed to every 6 gals. of spray, while in the South of France 2 oz. will suffice, except in vineyards where grubs are found at the close of the season or where pupae are abundant under the bark. In every 22 gals. of water the two formulae contain respectively 10 oz. and 6½oz. of anhydrous arsenate of soda with 30 oz. and 20 oz. of neutral acetate of lead. The arsenate is dissolved in 5½ gals. of water and the acetate in 16½ gals., after which it is slowly added to the arsenate solution. Only a quantity sufficient for the day's work should be prepared, freshly-made sprays being lighter and of more "sticking" power. To make this a wetting spray, Gastine has suggested the following modified formula: A soap solution is made by dissolving 20 oz. of dry white soap in 3 gals. of hot water, this being the dose for 22 gals. of spray. Arsenate of soda and acetate of lead are made up in separate solutions bulking 6 gals. each. After the acetate solution has been added to that of arsenate, 3½ oz. of Solvay carbonate of soda (dissolved in a little water) are added, if the weaker formula given above is being employed. For the strong formula, 5¼ oz. of Solvay carbonate of soda are necessary. The resulting mixture is diluted to about 18 gals., so that when the soap solution is finally added, 22 gals. of spray-solution result.

*Arsenate of lime.* This is very efficient, at least against *Haltica* and *Sparganothis*. The burns it is sometimes said to cause are usually slight in character and without influence on the crop. The following formula is given : Dissolve 1 lb. of anhydrous arsenate of lead in 10 gals. of water ; dissolve 13 oz. of sifted lime (fresh) in 2 gals. of water ;

add the lime solution to that of arsenate and mix ; finally dilute to a total bulk of 20 gals.

*Arsenite of lime.* This is very popular in America and may be prepared as follows : 2 lb. of white arsenic and 8 lb. of carbonate of soda are boiled for 15 minutes in $1\frac{1}{2}$ gals. of water. This solution should be labelled poison. The spray is compounded just before application by dissolving 2 lb. of slaked lime in 32 gals. of water and adding $\frac{7}{8}$ of a pint of the above solution. An alternative formula is : White arsenic, 1 lb. ; stone-lime, 4 lb. ; water $3\frac{1}{2}$ gals. Boil together for a full 30 minutes. For use this mixture is diluted with 160 gals. water. It is important that the lime be freshly made.

*Arsenate of soda.* Some vine-growers employ a simple solution of arsenate of soda, $3\frac{1}{2}$–4 oz. in 22 gals. of water, against *Haltica*. The risk of burns is considerable, even with so small a dose of arsenate, but the partisans of this method attribute little importance to the injury.

*Cupric-arsenical sprays.* These are easy to prepare, the cupric solution containing twice the usual amount of copper sulphate and the arsenical solution twice the arsenic. To obtain a 2 per cent copper sulphate spray two solutions must be made up : (1) Copper sulphate 4 lb. ; lime or carbonate of soda in sufficient quantity to neutralise ; water, 10 gals. (2) Arsenate of soda, 6 or 9 oz. ; acetate of lead 18 or 27 oz. ; water, 10 gals. These two solutions are then mixed and 20 gals. of correctly compounded spray will result. If either verdigris (cupric acetate) or the one-powder commercial cupric sprays are used the preparation of the insecticide is further simplified, for it is only necessary to dilute the above arsenate of soda solution with another 10 gals. of water and then add the verdigris or cupric powder, mixing thoroughly.

**Insect Notes.**—*Mthly. Bull. State Commiss. Hortic., Sacramento, Cal.*, iii, no. 4, April 1914, p. 189.

E. O. Essig reports that *Aspidiotus densiflorae*, Bremmer, the tanbark oak scale, and *Chionaspis quercus* have both been taken on *Quercus chrysolepis*, and *Eriococcus adenostomae*, Ehrh., on greasewood or chemiso (*Adenostoma fasciculatum*).

G. P. Weldon reports *Tetranychus mytilaspidis*, Riley, and *Bryobia pratensis*, Garm., on apple trees, where they were attacked by the ladybird beetle, *Psyllobora taedata*. He also found *Euthrips pyri* in an orchard in a locality hitherto free from this pest, and the clover aphis, *Aphis bakeri*, Cowen, was taken on quince foliage.

L. Childs reports great numbers of *Chionaspis pinifoliae*, the pine-leaf scale, on the yellow pine (*Pinus ponderosa*). The adults in April were all dead, but under the shells were found masses of eggs. He has also taken *Epidiaspis piricola* on mountain holly (*Heteromeles arbutifolia*). E. J. Vosler reports *Tipula simplex*, Doane, as being abundant in Sacramento.

Smith (H. S.) & Vosler (E. J.). *Calliephialtes* **in California.**—*Mthly. Bull. State Commiss. Hortic., Sacramento, Cal.*, iii, no. 5, May 1914, pp. 195-211, 15 figs.

This paper supplements that by Cushman [see this *Review*, Ser. A. ii, pp. 137–138], which dealt only with Virginia, and records certain variations in the habits and development of this parasite of *Cydia*

*pomonella* in California. It is now generally accepted that the parasite has been sufficiently tried and has been found to be unsatisfactory. In California, apples, where grown commercially, are placed in bins immediately after picking, consequently the codling-moth larvae seek winter quarters in the packing-house, where they are practically free from the attacks of parasites. But the most important factor in the inefficiency of *Calliephialtes* is the inaccessibility of the codling-moth larvae, the majority of the cocoons of which are so situated (in cracks and crevices in trees and the ground) as to be out of reach of the ovipositor of the ichneumon.

The males, which outnumber the females in the proportion of three to one, emerge about nine days before them. The newly-emerged female requires about nine days to develop eggs, which are deposited singly in any portion of the host cocoon; apparently less than one hundred eggs are laid. The life of the male is considerably shorter than that of the female, which lives for from two to three months. There are from five to seven broods in California in each year. The eggs hatch in about 68 hours at a mean temperature of 62° F. The five larval stages occupy from 17–23 days, and the larva requires from four to five days to complete the cocoon, which is spun inside that of the host. The pupal stage lasts from 13 to 24 days, the whole cycle thus occupying from 40 to 50 days at a temperature of about 61° F.

SMITH (H. S.). **The Importation of Black Scale Parasites from South Africa.**—*Mthly. Bull. State Commiss. Hortic., Sacramento, Cal.*, iii, no. 5, May 1914, p. 212.

Shipments of twigs of *Sparmannia africana*, infested with the black scale (*Saissetia oleae*), have been received at Sacramento from the Department of Agriculture, Union of S. Africa. Eleven species of undetermined parasites have been reared from this material, two of them, which are primary, in considerable numbers. One of the remaining species has been ascertained to be secondary, and some of the others also fall into this category. Both primary species emerge from the young scale *before* the eggs are laid, and they should therefore become valuable supplements to *Scutellista* and *Tomocera*, which attack the scale *after* the eggs are laid. So far as climatic conditions are concerned, these new parasites seem likely to become established in California. They evidently play an important rôle in the control of the black scale in South Africa, and every effort will be made to establish them.

VOSLER (E. J.). **Calendar of Insect Pests and Plant Diseases.**—*Mthly. Bull. State Commiss. Hortic., Sacramento, Cal.*, iii, no. 5, May 1914, pp. 214-218.

The author draws attention to several orange thrips, which distort the leaves or discolour the fruit. The spray recommended by the U.S. Bureau of Entomology consists of: Commercial lime-sulphur 33° Beaumé, $2\frac{1}{3}$ gals.; black-leaf extract, 2 gals. of $2\frac{3}{4}$ per cent.; water 200 gals. A pressure as strong as is possible should always be maintained and it may be necessary to make several applications. The first is usually applied just after most of the petals have fallen; the second, ten to fourteen days later; and the third, three to four weeks after the second.

**Insect Notes.**—*Mthly. Bull. State Commiss., Hortic., Sacramento, Cal.*, iii, no. 5, May 1914, p. 220.

E. O. Essig reports *Thricholepis inornata*, Horn, a small weevil, as damaging the foliage of almond trees, and *Amara stupida*, Lec., a Carabid beetle, was said to be injuring strawberry vines. Larvae and adults of a Longicorn beetle, *Xylotrechus nauticus*, Mann., have been taken from walnut trees, and *Gastroidea caesia*, Rog., the small green dock beetle, has been collected on grape vines. The author has bred specimens of the lesser shot-hole borer (*Xyleborus xylographus*, Say) from a dying prune tree, and pear tree foliage is stated to have been damaged by a Eumolpid beetle, *Glyptoscelis pubescens*, F., and by a new weevil of the genus *Amnesia*.

L. Childs reports that the Capsid bugs, *Irbesia brachycerus*, Uhler, and *I. sericans*, Stål, have been feeding, during April, in large numbers in grain fields where they often do considerable damage. They have also been found on *Amsinckia intermedia*, dock, mallow and wild mustard. *Magdalis gracilis*, Lec., has been numerous on the almond and other deciduous fruit trees this spring. Parasites were observed to be abundant in the autumn broods of the California oak moth (*Phryganidia californica*) last year, which accounts for the temporary relief from this destructive pest, the larvae of which are not nearly so numerous as in former years. *Pemphigus fraxini-dipetalae*, Essig, was noted causing considerable damage to ash trees and also to *Aesculus californicus*, the leaves being curled and malformed.

Demandt (E.). **Samoanische Kakaokultur.** [Cacao culture in Samoa.] —*Beihefte zum Tropenpflanzer, Berlin*, xv, no. 2-3, April 1914, 26 figs., pp. 135–307., 24 plans.

In this volume the author, a resident of Apia, has compiled a practical guide to cacao planting in Samoa. Cacao exports have risen from 1½ tons in 1900 to 934 tons in 1913, and up to the latter year only 5,600 acres had been taken up. Each tree costs from 5 to 6½ shillings until it begins to bear, when a revenue of 1 to 2 shillings is yielded in the first years of bearing. In these islands cacao is comparatively little attacked by diseases and insects. The latter include a Longicorn beetle (*Monohammus rusticator*, F.), a Rutelid beetle (*Adoretus vestitus*, Boh.), *Calotermes* (*Neotermes*) *sarasini*, Holmgr., and *Pseudococcus citri*, Risso. The usual remedies are briefly mentioned in each case.

Purves (J. M.). **Nyasaland Forestry Division.**—*Ann. Rept. Dept. Agric., Nyasaland Protectorate, for year ending 31st March, 1914, Zomba*, 30th April 1914, pp. 1-44.

Reporting on the Forestry Division for the year the author states that the ravages of white ants have rendered the cultivation of the quicker-growing trees such as Eucalyptus largely unprofitable. On ground infested by white ants good results have been obtained at Zomba with Eucalyptus by planting the trees 4 by 3 or 4 by 4 feet apart, instead of the usual distance, viz., 8 by 8 feet apart, so as to allow for thinning by the termites.

Lafforgue (G.). **Les bouillies cupriques mouillantes.** [Copper sulphate wetting sprays.]—*La Vie Agric. et Rur., Paris*, iii, no. 22, 2nd May 1914, pp. 611-614.

Soap, gelatin, casein and saponin are the " sticking " agents discussed in this article. Saponin and similar compounds are found in *Quillaia saponaria*, in the pericarp of *Sapindus utilis*, and in the chestnut. The advantage of saponin solutions lies in their adaptability to neutral or slightly acid solutions. They facilitate the emulsification of bodies insoluble in water, such as oils, etc., but do not interfere with the solubility of copper salts, so that the resultant sprays keep their immediate intensity of action. It is, however, difficult to obtain *Sapindus* commercially, and the " sticking " power is not very great. The mode of preparation is that given by Gastine [see this *Review*, A, ii, p. 123].

Picard (F.). **Un insecte nuisible aux vignes récemment plantées: le** *Nysius senecionis*. [*Nysius senecionis*, a pest of newly-planted vines.]—*La Vie Agric. et Rur., Paris*, iii, no. 22, 2nd May 1914, pp. 610-611.

Replanting is always accompanied by an increase of the enemies of young grafts. One of these is a Hemipteron which sensibly injured newly-planted vines in Aude, Hérault and Gard in 1912 and 1913, though nearly unknown previously. *Nysius senecionis*, Schill, is a bug belonging to the family Lygaeidae. It was first observed in Vaucluse in 1869 by Lichtenstein, and since then has been reported from Aude, Algeria and Tunisia. In association with L. Semichon, the author studied it in 1912, when its attack was general and severe to a degree unknown till then in French vineyards, though equalled in 1913. The most careful observations were made at Ginestas, near Narbonne, where some twelve acres, newly planted with *riparia-rupestris* vines, were so thickly infested by *Nysius* that the plants and ground appeared black in some places, and the leaves withered rapidly from their attacks. One-third of the vines were withered and apparently destroyed. The infestation had begun a few days previously, when ploughing had been done in order to free the vineyard from a weed (*Diplotaxis erucoïdes*). This undoubtedly caused the trouble by depriving *Nysius* of its usual food. Elsewhere, observations during two years have shown that *Nysius* infestation always occurred in newly-planted vineyards where *Diplotaxis erucoïdes* grew, and always began immediately after a summer ploughing. In one case older plants were attacked, but they were close to young ones. At Bages, the *Diplotaxis* around the vines were covered with thousands of *Nysius*, but the vines were not attacked. Vineyards of two or three-year-old vines should not be ploughed in July if *Nysius* has been noticed on *Diplotaxis* growing in them, and in spring this plant should be prevented from growing. Failing this simple cultural remedy, the following petroleum-soap emulsion will give good results, if quickly applied, as the damage is done in a very few days :—Sulphate of copper 2 lb., black soap 2 lb., petroleum 16 lb., water 20 gals. The sulphate may be dispensed with, but owing to the large amount of petroleum, the emulsion must be made with the greatest care. Another preferable method is to drive

the insects off the vines by sluicing with cold water, following this up by dusting with lime. The insects should be attracted to heaps of *Diplotaxis* taken from neighbouring vineyards. Sulphuric acid, petroleum, boiling water, etc., may then be poured on these heaps. The insecticides should also be sprayed on the soil around each infested plant, as *Nysius* also hides under clods.

FEYTAUD (J.). **Instruction pratique pour la défense contre la Cochylis et l'Eudémis.** [Practical instructions for the control of *Clysia* and *Polychrosis*.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xiii, no. 5, May 1914, pp. 69-74.

Spraying may be carried out in spring against the first generation, or in summer against the second. Arsenicals should only be used in spring [see this *Review*, Ser. A, ii, p. 552]. Preventive spraying, applied during a certain period, is the most efficacious. This time extends from the date of maximum flight to that on which the caterpillars begin to cover the flower in the case of the first generation, or begin to penetrate into the grapes in the case of the second. The date of maximum flight provides a sure indicator for starting preventive control, though in spring the spraying must be delayed until the flowers are open. A sprayer which leaves one hand free to push aside the leaves is the best. As a preparation for summer spraying the foliage should be summarily thinned from May onwards. This thinning will not only reveal the grape-bunches but also reduce infestation. In spraying against the vine moth special care must be taken to reach the flowers or the grapes. Bait-traps [see this *Review*, Ser. A, ii, p. 511] are very useful when in general use. They are actually harmful in small vineyards surrounded by untreated ones. Shelter-traps, consisting of a rag wrapped round the vine stock, are useful auxiliaries.

**Sur le Blaniule moucheté.** [*Blaniulus guttulatus.*]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xiii, no. 5, May 1914, pp. 83-84.

Often called *Iule des fraises* (Strawberry Millipede) because of its preference for ripe strawberries, this small brown Myriapod also attacks potatoes, rape, turnips, pumpkins, cucumbers, and the bulbs of onions, garlic, tulips and hyacinths, as well as fallen fruit. Where germination is retarded in a cold, damp spring, seed, especially that of beetroot and wheat, is destroyed by it. Slices of potato or of fruit make good traps. The soil may be cleared by injecting carbon bisulphide or by watering with potassium sulphocarbonate. Seed may be protected by dipping in a solution of phenic acid and sulphate of magnesia, and very early sowing is best avoided in order to obtain rapid germination.

**The Coconut Beetle in British E. Africa.**—*Ann. Rept. Dept. Agric., Br. E. Africa, for 1912-13*, London, 1914, p. 17.

For some months during the year, Mr. Dopwell, Plant Instructor, has been on itinerary work demonstrating to the natives the destruction caused to their coconut trees by the *Oryctes* beetle, and urging

them to cut up and burn all dead trees; but although the natives are well aware of the fact that the dead trees are the main breeding grounds of the beetle, very few could be induced to adopt the measures recommended.

The beetle has been established in the coast belt for many years, but as in Ceylon, it has not spread to anything like the same extent as in Samoa, and it is probable that both in this Protectorate and Ceylon it has natural enemies, though so far no parasites have been found. There is little doubt, however, that the beetle is gradually, if slowly, increasing in numbers. In the trunks of 957 dead trees no fewer than 7,650 beetles and 28,710 grubs were found, or an average of eight beetles and thirty grubs from each tree. It is estimated that 2 per cent. of the coconut trees (including trunks lying on the ground) are dead, and in view of the indifference of the natives it will be necessary to introduce compulsory legislation to deal with the matter.

HOWLETT (F. M.). **Report of the Imperial Pathological Entomologist.** —*Rept. Agric. Research Inst. & Coll., Pusa, for 1912–13, Calcutta,* 1914, pp. 78-83.

The work of the department has been practically confined during the year to fruit flies of the genus *Dacus*.

A poison-spray method, which depends for its efficacy on the habit of the peach fly (*D. zonatus*) of sucking tentatively at any little drop of moisture on a leaf, was tried with excellent results. The proportion of affected peaches in the sprayed plots was approximately 2 per cent. over the whole period of picking, in place of the usual 45–60 per cent. The cost of the method is very small compared with the value of the crop, and should this year's results be confirmed by another season's work, they will have a very considerable commercial importance.

It has been found that these insects are strongly attracted by certain compounds allied to Eugenol ($C_{10}H_{12}O_2$), and this substance constituted a means of detecting the presence of the fruit flies in a given locality with a certainty quite unattainable by any ordinary method of observation.

The author discovered by this means that the north-western limit of the distribution of the peach fly practically corresponds with the south-eastern limit of successful peach-growing.

It has been shown by Mr. and Mrs. Howard that it is possible to grow peaches of the first quality at Pusa, and the author says that, in his opinion, the reason why peaches are not largely or profitably grown in the southern and eastern portions of the Gangetic Plain and in various districts in Southern India is largely or entirely due to the prevalence of peach fly, 50 per cent. or more of the crop being invariably maggoty. The successful application of the poison-spray method may therefore possibly result in the opening up of large areas of profitable cultivation.

SCHOLL (E. E.). **Entomology on the farm.**—*Bull. Texas Dept. Agric. Austin*, no. 35, Jan.-Feb. 1914, pp. 66-70.

In a paper read before the third meeting of the State Farmers' Institute the author says that injurious insects cost Texas something like 40,000,000 dollars annually, and these pests have enormously

increased within the last few years and are now so numerous that it is absolutely necessary for the farmer to begin to study their habits and the methods of controlling them.

Amongst reasons for this increase the author cites the following :—(1) The destruction of the original food-plants and the adaptation of the pests to cultivated crops ; (2) the destruction of insectivorous birds and animals ; (3) greatly increased communication, which has facilitated the transport of insect pests from place to place, generally without their parasites, so that there is no natural agency to hold them in check ; (4) years ago, when farms were very scattered, the migration of pests from one farm to another was not easy, but now that the country is more cultivated and farms lie close to one another this natural barrier has disappeared ; (5) it was a practice, when the author was a boy, to burn all rubbish on the farms every year, but there was then no proper rotation of crops, and the farmers discovered that this system deprived the soil of necessary humus and the burning of rubbish ceased, to the great advantage of many insect pests ; (6) when farms were smaller the crops were harvested early enough to enable autumn ploughing, at present the farms are so large that this cannot be done and consequently the pests can hibernate in peace ; (7) many fields and useless orchards have been abandoned and left in a state of utter neglect, and these provide good breeding places for pests.

The author then goes on to describe very briefly the ordinary methods for combating such insects and strongly advises the farmers to acquaint themselves with the habits of those pests which come under their notice, to report to the Department of Agriculture and seek advice before the damage becomes too serious. He cites a case where a farmer saved his entire cotton crop of 80 acres by using turkeys to eat the grasshoppers. This was effected by keeping the turkeys under control, they being only driven round the fields at regular intervals, so that they were hungry and active. A neighbouring farmer who did not adopt this method lost 25 per cent. of his crop. The grasshoppers make very good food for turkeys, and he strongly advises the breeding of turkeys in grasshopper areas, not only as a source of profit, but as useful aids to the farmer in keeping down pests.

MORRIS (H. E.) & PARKER (J. R.). **Fungicides and Insecticides for Montana.**—*Montana Agric. Expt. Sta., Bozeman*, Circ. no. 16, Feb. 1914, 56 pp. [Received 16th June, 1914.]

This bulletin is intended to give the fruit-grower and farmer a more or less concise account of each compound or mixture generally in use. The authors devote 17 pages to fungicides, and the remainder to insecticides ; only the more important of the latter are here noticed. According to the insecticide laws of the State of Montana, Paris green must contain arsenic equivalent to not less than 20 per cent. of arsenious oxide, and must not contain more than $3\frac{1}{2}$ per cent. of arsenious oxide soluble in water. The following rough test for adulteration is given :—Four tablespoonfuls of strong ammonia are added to one teaspoonful of Paris green in a glass ; if the whole does not dissolve to a clear blue liquid, adulterants are present; but the adulterants may be so

devised that they will be soluble in ammonia. The test will not indicate the presence of soluble arsenic or of arsenic trioxide, and if unusually severe burning occurs, or if suspicion of adulterants is aroused by means of the test just explained, a sample should be submitted to a competent chemist for analysis. For use dry, the Paris green should be mixed with 20 times its weight of flour or air-slaked lime, well sifted and dusted on to the plants, preferably after rain or when they are wet with dew. As a spray the following are advised :—For potato beetles (*Leptinotarsa* 10-*lineata*), 1 oz. of green in 4 gals. of water; for cabbage worms, 1 oz. with 4 oz. of soap in 4 gals. of water; for sugar-beet webworm (*Phlyctaenodes sticticalis*), 2 oz. with 4 oz. of soap in 4 gals. of water; for cutworms, 8 oz. with 20 lb. of wheat bran, 1 quart of cheap molasses, and water enough to render the mixture wet but not sloppy; a small quantity of this bait to be placed on the base of plants to be protected late in the afternoon or in the evening. In the use of all sprays containing Paris green care must be taken that the mixture is thoroughly agitated during use, or uniform distribution will not be obtained. Paris green is not recommended for fruit trees because of its liability to injure the foliage. It is easy to apply and acts quickly, but at the same time is easily washed off by rain. The local price is given at 1*s*. 0½*d*. per lb. wholesale and 1*s*. 5½*d*. per lb. retail.

*Arsenate of Lead.* The State laws require that commercial brands, in paste form, must not contain more than 50 per cent. of water and must contain arsenic equivalent to 12½ per cent. of arsenic oxide; not more than the equivalent of 3 to 4 per cent. of arsenic oxide soluble in water is permitted. The authors give various catalogue names for lead arsenate and say that there are practically only two kinds which are of value. One, ortho or neutral arsenate of lead, having the formula $Pb_3 (AsO_4)_2$, and acid arsenate of lead, which has the formula $PbHAsO_4$. According to law, the first of these preparations should contain 25 per cent. of arsenic oxide on a dry basis and the latter 33 per cent. Many of the preparations sold commercially are mixtures of the two, but the authors strongly recommend the acid arsenate because of the higher arsenic content and the fact that it does not settle so rapidly when mixed with water. They do not advise even large growers to make their own arsenate from acetate of lead and arsenate of soda. They give the following formulae for use :—Against codling moth (*Cydia pomonella*), 2 lb. in 50 gals. of water; against green fruit worm and tussock moth caterpillars (*Hemerocampa*), 5 oz. in 4 gals. of water; and against all chewing insects 4 oz. in 4 gals. These formulae are for the paste form; with dry or powdered arsenate of lead use one-half as much. Directions are given for preparing a stock mixture and the use of soap is said to be of somewhat questionable advantage, as it apparently increases the solubility of arsenate of lead and thus increases the injury to the foliage. Paste arsenate, if stored, should be kept covered with water and precautions taken to prevent it freezing. The principal advantages of the dry form are that it will keep indefinitely, can be very easily handled, and costs less for carriage. With regard to arsenate of lead in combination, mixtures should be made only just before use, otherwise chemical changes may occur resulting in foliage injury. The disadvantage of arsenate of lead is that it acts slowly and that the carriage of the paste forms is

expensive. The Montana price of the paste is from 6*d*. to 7½*d*. per lb. in quantity and about 1*s*. 0½*d*. per lb. in 5 lb. lots. Dry arsenate costs about 1*s*. 0½*d*. in quantity and 1*s*. 5½*d*. in 5 lb. lots.

*Arsenite of zinc.* The manufacturers claim that this product is an "ortho" arsenite of zinc containing at least 40 per cent. arsenious oxide, of which less than 1 per cent. is soluble in water. It is thus almost as high as Paris green in arsenic content and as low as arsenate of lead in water-soluble arsenic. The manufacturers recommend the use of 12 oz. to 50 gals. of water; and this proportion for codling moth, and 1 lb. in 50 gals. for potato beetles and cabbage worms, has given good results in Montana. Unfortunately, though a good insecticide, it cannot be used on the foliage of peach or other stone fruits without injury, neither can it be used in combination with Bordeaux mixture. The worst foliage injury appears to occur when it is used late in the summer or in combination with other sprays. The authors state that they cannot unreservedly recommend this insecticide as a spray for the apple orchard. One application early in the season, as for example the first spray for codling moth, is apparently safe, but there seems to be an accumulative effect that makes later applications dangerous. Volck has suggested the addition of an equal weight of commercial iron sulphide to prevent foliage injury, and he states that when iron sulphide is added the insecticide may be combined with "Black Leaf 40." The cost is about 10*d*. per lb. for 40 lb. lots.

Hellebore (the powdered root stock of the plant, *Veratrum album*) is generally sold as a remedy for the rose slug and currant worm. As the powdered root deteriorates very rapidly when exposed to the air, much of it, as sold, is practically worthless, and its high cost as an insecticide, 1*s*. 5½*d*. per lb., is against its use, especially as thorough spraying with arsenate of lead after the leaves expand will give better protection at less cost.

In dealing with contact insecticides, the authors enter fully into the preparation of lime-sulphur and lay stress upon the well known fact that lime from magnesian limestone is useless for the preparation, as the magnesium oxide breaks down the sulphur compounds which constitute the effective agents in the spray. The question of the relative cost of commercial versus home-made lime-sulphur is gone into, and the authors say that when the small grower can buy good commercial lime-sulphur at £2 per barrel there is little or no saving effected by preparation at home, to say nothing of the cost of plant and the time and labour involved. The use of the hydrometer for determining the strengths is explained and dilution tables are given.

*Kerosene emulsion.* The authors' formula is:—Ordinary bar soap ½ lb., soft water 1 gal., kerosene 2 gals. This is to be regarded as the concentrated stock solution and, if properly made, will keep for some time. For use on trees in foliage dilute with 10–15 parts of water. Montana growers, it is said, have not been very successful in the use of this emulsion. Soft water is difficult to obtain and the oil soon separates and causes injury if used upon trees in foliage. The addition of soda has been tried in order to remedy this defect, but the result was not very satisfactory.

*Linseed oil emulsion.* The authors say that against oyster-shell scale this emulsion was found to be the most effective out of the large

number tried; the only drawback to its use is the cost of the oil—4*s*. 2*d*. per gallon. As lime-sulphur is cheaper and will control the scale if properly applied, linseed oil emulsion has not been recommended, but where trees are very badly infested a first spraying with this emulsion may well be afforded, because of its greater and more immediate effectiveness. Linseed oil emulsion also has a special value for spraying trees which are close to buildings as it does not damage paint. The stock solution is directed to be made as follows:—Raw linseed oil 2 gals., soft soap 2 quarts, rain-water 1 gal. The soap is dissolved in boiling water and the oil at once added and the mixture churned to a creamy emulsion. For use, dilute 1 gal. of this with 15 gals. of water. The authors say that they have obtained the best results by making the solution immediately before use.

*Tobacco extract.* Within the last few years several tobacco extracts, the best known of which are "Black Leaf" and "Black Leaf 40," have come into prominence as contact insecticides, being used with marked success against plant lice. They are guaranteed to contain 2·7 per cent. and 40 per cent. of nicotin respectively; the nicotin is said to be in the form of nicotin sulphate. The authors give the following formulae:—For plant lice use "Black Leaf 40" $\frac{3}{4}$ oz., soap 2 oz., water 4 gals.; or "Black Leaf" 1 gal., soap 2 lb., water 60 gals. The soap is not absolutely necessary, but improves the penetration qualities of the spray. "Black Leaf" costs about 6*s*. 3*d*. a gallon and "Black Leaf 40" £2 12s. for 2 lb.

Combination sprays are dealt with, and the authors remark that their use is becoming general, their chief value being that two insecticides are applied at one operation, and this is occasionally of great importance when the weather is treacherous. The desirability or otherwise of certain combinations, particularly that of lime-sulphur with lead arsenate, is discussed. Paris green should not be used with tobacco extract or lime-sulphur, but may be used with Bordeaux mixture. Arsenate of lead may be used with all three, but lime-sulphur mixture then has an increased tendency to burn the foliage. Arsenite of zinc is not advised with tobacco extract or Bordeaux mixture.

The bulletin concludes with a table showing the times for spraying against a number of common orchard and garden pests.

THEOBALD (F. V.). **Report on Economic Zoology.**—*South-Eastern Agric. Coll., Wye*, 2nd April 1914, 158 pp., 69 figs., 17 pl.

The present report deals with some of the enquiries received between October 1st, 1912 and September 30th, 1913, with regard to insects as pests on cultivated plants or as harmful to man and animals. Under each insect mentioned a short account is given of the injury it does and the best method of destroying it; the author says that comparatively few of the communications he has received contained any features of special interest, the majority being in connection with common pests or methods of spraying. The following lists are of the pests which have attacked fruit trees and bushes:—

Apple pests: Hop dogs (*Dasychira pudibunda*); Dark Gothic Moth (*Naenia typica*); Wood Leopard (*Zeuzera pyrina*); *Charadrina quadripunctata*, attacking stored apples; Pale Brindled Beauty Moth

(*Phigalia pilosaria*); Green Pug Moth (*Chloroclystis rectangulata*); *Antithesia pruniana*; cockchafer grubs (? *Melolontha melolontha*); Nitidulid beetles (*Meligethes* spp.); *Otiorrhynchus picipes* and *O. tenebricosus*; leaf weevils (*Phyllobius oblongus*); Black Fly (*Aphis rumicis*); Capsid bugs (*Atractotomus mali* and *Orthotylus marginalis*); Woolly Aphis (*Schizoneura lanigera*); and the mussel scale (*Lepidosaphes ulmi*).

Currant pests: Currant Shoot Moth (*Incurvaria capitella*) and green Capsid bugs (*Orthotylus marginalis*).

Gooseberry pests: Gooseberry gall midge (*Rhopalomyia grossulariae*); gooseberry sawfly (*Nematus ribesii*); peach scale (*Eulecanium persicae*); mussel scale (*Lepidosaphes ulmi*).

Plum pests: Plum-leaf sawfly (*Cladius padi*), plum fruit sawfly (*Hoplocampa fulvicornis*), shot-borer beetle (*Xyleborus dispar*).

Raspberry pests: Raspberry cane borer (*Phorbia* sp.); raspberry beetle (*Byturus tomontosus*).

Strawberry pests: Swift moth (*Hepialus lupulinus*), an Aphis (*Macrosiphum fragariellum*) and an eelworm (*Aphelenchus fragariae*).

Vine pests:—A Tortricid moth (*Batodes angustiorana*); vine weevil (*Otiorrhynchus sulcatus*).

Aphides of various species which were threatening to destroy crops of apples, currants and peaches were kept well in check by the fungus *Entomophthora aphidis*, Hoffman, the good done by it in controlling *Aphis* attacks being greater than that due to parasitic or predaceous enemies.

The author refers to the effect of manuring trees as a means of combating their insect enemies. In Germany (Germersheim) plum trees subject to the attack of *Scolytus* and *Xyleborus* were manured, some with potassium phosphate and others with lime only; the former had a loss of $8\frac{1}{2}$ per cent. due to the insects, the latter $16\frac{2}{3}$ per cent.; untreated trees showed a loss of $33\frac{1}{3}$ per cent. The author holds that the result was due to the more rapid growth of wood in the manured trees, which would lead to the closing up of the holes made by the insects and stop further damage. The question of the effects of manuring in rendering trees resistant to attack has not been worked out, but from personal observation the author is lead to believe that in many cases a spray is valuable not in directly destroying the pest, but in the after effects it produces on the tree, and he considers the subject worthy of study from this point of view.

The effect of lime-sulphur spray as an insecticide is discussed at some length; the following conclusions are given:—That as a cleanser of trees from insects and mites hibernating on them lime-sulphur is far behind caustic soda, or hot lime and salt, and on old trees it is practically of no value for this purpose; little or no good results from the use of lime-sulphur as an ovicide; as a summer insecticide it is of definite value for checking pear-leaf blister-mite (*Eriophyes pyri*), peach scale (*Eulecanium persicae*), pear-tree oyster scale (*Aspidiotus ostreaeformis*) and San José scale (*A. perniciosus*), and under certain conditions has a deleterious effect upon the newly hatched mussel scale (*Lepidosaphes ulmi*) and some of the red spiders; it appears to have some slight value as a stomachic poison for some cater-

pillars, but so many of these are not affected at all that it can claim no place as a poison wash against arsenate of lead or nicotin ; in the majority of cases it is useless as a contact wash.

Various other plants and their pests are dealt with, including :— Hops : Millepedes (*Blanjulus guttulatus* and *Julus pulchellus*), Bramble moth (*Acronycta rumicis*), *Bibio hortulanus*, and earwigs (*Forficula auricularia*). Cereals : Eelworm (*Tylenchus devastatrix*) and Frit Fly (*Oscinis frit*). Root crops : Mangold Black Fly (*Aphis rumicis*).

The Melon Aphis (*Aphis gossypii*) is recorded as attacking marrows and cucumbers, and it is stated that *A. cucurbiti*, Buckt., *A. illata*, Wlk., and *A. malvae*, Koch, are all synonyms of this species. A number of other insects found on vegetables, ornamental plants and trees are also recorded.

The Tabby Moth (*Aglossa pinguinalis*) was found destroying barley in sacks ; a mite, *Carpoglyphus anonymus*, caused some damage to dried fruits, sugar, etc. : while the occurrence in large numbers of *Aleurobius farinae*, a flour mite, and of *Glyciphagus domesticus*, a furniture mite, is also recorded.

The report, as usual, is very fully illustrated.

FINTZESCOU (G.). **Contribution à l'étude de la Biologie d'*Hyponomeuta malinella* en Rumanie.** [Contribution to the study of the biology of *Hyponomeuta malinellus* in Roumania.]—*Rev. Scient. Bourbonnais, Moulins*, xxvii, no. 3, 1914, pp. 78-80.

The author has studied the biology of *Hyponomeuta malinellus* in Roumania during the last few years and has found that there are three generations in the year. The winter eggs are laid in June and July, and hatch out in March or April, according to temperature conditions prevailing in February and March.

MACDOUGALL (R. S.). **Bee Diseases and Bee Enemies.**—*Trans. Highland & Agric. Soc of Scotland*, 1914. Reprint, 20 pp., 3 figs.

The author in this paper gives a general account of the subject, and summarises the main results of recent work. He cites papers dealing with the Isle of Wight bee-disease by Graham-Smith, Fantham, Porter, Bullamore and Maldon, and on sacbrood and foulbrood by White and Maassen [see this *Review*, Ser. A, i, pp. 330-331, 186 and 523]. The large wax-moth (*Galleria mellonella*), the lesser wax-moth (*Achroia grisella*), the bee-louse (*Braula caeca*) and *Aphomia sociella* are included as bee enemies. In connection with protective measures against wax-moths, the author refers to a paper by Paddock [see this *Review*, Ser. A, i, pp. 453-454.]

JOHNSON (J.). **The Control of Diseases and Insects of Tobacco.**—*Wisconsin, Agric. Expt. Sta., Madison*, Bull. no. 237. May 1914, 34 pp., 9 figs.

The principal insects attacking tobacco are cutworms, horn or tobacco worms and grasshoppers. Late autumn ploughing is the most simple means of reducing the numbers of cutworms and tobacco

worms. Against cutworms, poisoned bait made by cutting up clover that has been sprayed with Paris green at the rate of 1 oz. to 6 gallons should be scattered in the field a couple of days before the tobacco is transplanted. The spray recommended for use against cutworms and tobacco worms is made with from 4 to 5 lb. arsenate of lead paste to 50 gallons of water; one man with a compressed air sprayer should be able to apply this mixture to about 2 acres of tobacco a day; the poison costs from 7½*d*. to 10*d*. a pound.

Pratt (H. C.). **Locust spraying experiments.**—*Agric. Bull. F.M.S., Kuala Lumpur*, ii, no. 10, May 1914, pp. 249-255.

This is a detailed report of spraying with arsenite of soda, London purple and Paris green, "Four Oaks" knapsack sprayers being used. Twenty-two experiments were made, of which eighteen are recorded. The cheapest and most effective solution of arsenite of soda was made by dissolving 1 lb. of arsenite in 1 gal. of water, diluted with 4 gals. of water for use. In one experiment the arsenite was dissolved by boiling in 1 gal. of water, and after diluting with 4 gals. of water, 3 lb. of molasses were added. The locusts were enclosed in an area of 12 square yards, sparsely covered with short grass. The solution was sprayed at 11.25 a.m. in the hot sun. Only a little rain fell after spraying. Practically 100 per cent. of the locusts were dead at 5 p.m. In another experiment only 2 lb. of molasses were used. When high lalang grass full of 4th instar locusts was sprayed there was no sign of living locusts the following morning, though a few dead ones were found, but owing to the thick lalang and the fact that the locusts had probably scattered it was difficult to see them. In another case 1 lb. of arsenite was dissolved in 1 gal. of water, to which 4 gals. of water and 1 lb. of molasses were added. This was used on a fairly large swarm of locusts covering about 4 acres, where there was little grass on the ground, though it was surrounded by lalang and blukar grass. Two sprayers were used; a belt of grass 5 or 6 yards wide was first sprayed round the swarm and then the inner area was treated. Spraying was conducted between 8 and 11 a.m. in hot sun, heavy rain falling at 3 p.m. By 1 p.m. many locusts were dead and practically the swarm had perished by 5 p.m.

From the results obtained with London purple it is apparent that mixtures containing 1 lb. of this poison in either 6 or 12 gals. of water are the only ones likely to be of use in the field. In one experiment 1 lb. of London purple was mixed with 12 gals. of cold water and 4 lb. of molasses were added. The locusts were enclosed in an area of 12 square yards, over which there was a fair amount of short grass. Spraying was effected at 11.45 a.m. in the hot sun. About 70 per cent. of the locusts were dead at 5.10 p.m. on the same day, and by 10 a.m. next morning every individual had perished. The experiment was repeated with half the amount of water, viz., 6 gals., all other conditions being similar, except that spraying took place earlier in the day, at 10.15 a.m. About 70 per cent. of the locusts were dead at 5.20 p.m. on the same day and 98 per cent. the next morning at 10 a.m.

One lb. of Paris green in 6 gals. of water proved an effective proportion. In three experiments, ½lb. of Paris green was mixed with 3 gals. of water and 2 lb. of molasses were added. In one of these, the enclosed area, which was well covered with grass, was sprayed at 11 a.m. on a dull day, there being a little rain at 11.30 a.m. At 5.20 p.m. on the same day 10 per cent. of the locusts were dead and this figure rose to 90 per cent. by 9 a.m. on the following morning. In two other experiments, areas of 12 square yards containing hoppers of the 5th instar were enclosed and sprayed at 11 a.m. in the hot sun. At 8.30 a.m. about 70 per cent. of the enclosed locusts were alive, but some were developing wings, which would account for their not feeding. Paris green is slow in its effect, and in considering the result of these experiments it must be remembered that the locusts were enclosed and had no option but to eat the poisoned grass.

In solutions of the strengths mentioned above, the relative costs of the three poisons work out at the following rates per gallon in the Federated Malay States :—Paris green, 3*d.* ; London purple, 2*d.* ; arsenite of soda, 1½*d.* ; the latter being thus not only the most effective but the cheapest. A nozzle producing a very fine mist should be used. Four gallons of solution should cover about 400 square yards (48 gals. per acre), and a coolie under normal conditions can spray 1 acre a day. Very great care must be taken in using strong solutions of arsenite, and spraying should not be carried out in the precincts of native villages, unless special precautions be taken to prevent fowls, &c., being poisoned. Arsenite of soda cannot be sprayed on plants that must not be killed, but is satisfactory in other respects, as grasses sprayed die very rapidly and cattle cannot therefore graze over a poisoned area. It is not easy to boil water in the field, but this is not necessary if the arsenite is well ground up.

**Insect Notes.**—*Ann. Rept. Dept. Agric. & Cr. Lands, Seychelles, for 1913, Victoria,* 1914, pp. 13-17.

*Coccus viridis* (*Lecanium viride*) is reported as still doing great damage in the country to coffee, citrus and ixora bushes in spite of the fungus *Cephalosporium lecanii*, which keeps the insect in check more easily above 1,000 feet elevation. This fungus has been found this year attacking *Eucalymnatus tessellatus* (*Lecanium tessellatum*) on cinnamon. *Chrysomphalus aonidum* (*Aspidiotus ficus*) has extended during the last three years to various islands of the Archipelago, some at 150 miles distance from Mahé, and coconut trees were seriously attacked. The following trees used as supports for vanilla between limes and coconut were also attacked by this scale :—Frangipane (*Plumeria acuminata*), breadfruit (*Artocarpus incisa*), pseudo-sago palm (*Cycas officinalis*) ; citrus and roses are also food-plants of this insect. Frangipane should never be grown amongst coconuts because it is the common food-plant of *Coccus* (*Lecanium*) *hesperidum*. The Takamaka (*Calophyllum triophyllum*) is also a host plant of *Eucalymnatus tessellatus* and is constantly present on cinnamon plants used as supports for vanilla in or near coconut plantations.

*Chrysomphalus aonidum* spreads suddenly after remaining dormant for years and it is very important that it should be combated in this dormant state, especially on small trees and roses which are more

easily accessible than tall coconut trees. It is apparently fatal to young coconut trees suffering from drought or from unsuitable soil, and its presence is clearly noticeable at a distance by the spotted appearance of the leaves. It spreads quite as easily in wet as in dry years, and the young leaves should be burned or scorched with quite as much care as the older ones.

*Coccus hesperidum* and *Eucalymnatus tessellatus* have been found to infest leaves of the Water Hyacinth (*Eichornia crassipes*). The scale-insects are nearly always accompanied by ants, the commonest of which, *Technomyrmex albipes*, has been studied, especially as the species has also become a common household pest. These black ants are supposed to have been introduced in 1904 from Ceylon in a consignment of coconut, cacao, nutmeg and Hevea rubber seedlings, which arrived by H.M.S. " Merlin," but there is abundant proof that they are indigenous, as they were described as far back as 1861 by Smith, having been found in a consignment of palms received at Kew from the Seychelles. It was not, however, until after 1906 that they became household pests nearly everywhere in Victoria, and this fact can only be accounted for by the increase of scale-insects, which, after the droughts of 1904, obtained a strong hold and caused the destruction of most of the Citrus, Hibiscus and Liberian coffee plants growing in the colony. In Mahé the spread of the ants has been estimated at about 1 mile per annum and was more or less coincident with the spread of the scale-insects. With the exception of La Digue, North Island, Marianne and Aride Island in the Mahé group, Aldabra, Astove and Cosmoledo in the Aldabra group, and the Amirantes, all the other islands are infested, and if no measures are taken to stop the distribution of ants carried in supplies purchased from ships, it will not be long before these insects have invaded the whole archipelago, as there is no climatic factor which can hinder their dispersal. They have not, however, spread above 1,500 feet, though it is not yet known whether this is due to climate or to the presence of parasites.

These ants are principally troublesome owing to the protection they afford to countless numbers of scale-insects, with the following species of which they are associated :—*Icerya seychellarum*, *Eucalymnatus*, *Coccus longulus*, *Coccus viridis*, *Pseudococcus* (*Dactylopius*) *citri*, *P. virgatus*, *Asterolecanium epidendri*, *Pulvinaria psidii*, *P. antigoni*, *Vinsonia stellifera*, *Chrysomphalus aonidum*. They seem not to care in the same degree for :—*Chionaspis inday*, *Hemichionaspis minor*, *H. aspidistrae*, *Aulacaspis* (*Diaspis*) *pentagona*, *Mytilaspis auriculata*, *Saissetia nigra* (*Lecanium nigrum*), *Asterolecanium bambusae*, which are quite as common insects as those in the preceding list, but they have to become strongly established on certain species of plants before the ants are attracted by them. These ants and their habits are described at length, and the importance of their destruction as the propagators of scale-insects is strongly insisted upon. Nests may be destroyed by spraying with soda-resin solution and by the use of trap boxes, the contents of which are periodically burned. [See this *Review*, Ser. A, i, p. 328.]

The Rhinoceros beetle in the Seychelles interferes greatly with the growth of young coconut trees and all palms are attacked with the

exception of areca nut, *Crystostachys*, *Nyophorbe*, *Caryota urens*, *Chrysalidocarpus* and various species of *Atenga*. The coco-de-mer is fortunately seldom attacked. *Luvistonas*, *Verschaffeltia*, *Oreodoxa* and *Deckenia* are the favourite food-plants. Another coconut beetle (*Melitomma insulare*) is very common and does much damage, but is kept under better control than formerly by the destruction of the fallen trees and by removing the larvae from standing ones, although this involves a considerable amount of labour. They are difficult to trap as they breed inside the trees and the females do not seem to travel far; the males, on the contrary, fly a considerable distance. In well-kept plantations the beetle is not so common as formerly, though 11 per cent. of young trees (about 10 years old) were found to be badly attacked in many cases.

Bodkin (G. E.). **Report of the Economic Biologist of British Guiana for 1912-1913.**—*Georgetown*, 1914, 10 pp.

As regards the sugar-cane pests, *Castnia licus* was less troublesome, but termites more so, owing to the exceptional drought. The work of past years in the reduction of *Castnia* and other cane pests is now apparent, except in the case of *Diatraea saccharalis*, F., and *D. canella*, Hmp. The collection of *Diatraea* egg-masses, the use of trap-lights and the cutting out of young cane dead hearts, followed by the collection of the pupae in them, are all excellent measures if properly carried out. The following is a preliminary list of insect enemies of *Diatraea*, some being original observations:—*Trichogramma minutum*, Riley, *Prophanurus alecto*, Cwfd.; two undetermined species of ants; the Braconids, *Iphiaulax medianus*, Cam., *Cremnops parvifasciatus*, *Mesostenoideus* sp.; the Chalcid, *Heptasmicra curvilineata*, Cam.; an undetermined Tachinid fly; an Elaterid larva; the Histerid, *Lioderma 4-dentatum*; the larva of a Stratiomyid fly. [See this *Review*, Ser. A, ii, p. 520.] A list is also given of 15 new cane pests, of minor importance, but which require watching.

Rice pests include the rice caterpillar, *Laphygma frugiperda*, S. & A., [see this *Review*, Ser. A, i, pp. 318 & 480] and the grass moth, *Remigia repanda*, Fabr., [see this *Review*, Ser. A, ii, p. 519], which were the only serious ones. A parasitic fungus, which appeared among a species of Pentatomid bug (*Tibraca limbativentris*, Stål) abundant on rice this season, has been briefly studied. The following is a list of insects which from time to time have been observed to attack rice in British Guiana:—*Maenas laboulbenei*, *Diatraea saccharalis*, L., *Scirpophaga albinella*, Cramer; two species of Chrysomelid beetles; *Pseudococcus calceolariae*, Ckll.; *Tomaspis flavilatera*, Urich, *Mormidea ypsilon*, L., *Tibraca limbativentris*, Stål; *Conocephaloides maxillosus*, F.

Para and other rubber trees received a serious set-back through defoliation by the caterpillars of the cassava hawk-moth, *Erinnyis* (*Dilophonota*) *ello* [see this *Review*, Ser. A, i, pp. 139 & 258], which attacks nearly every species of Euphorbiaceae and is thus able to complete its life-history in the forest or on waste lands. On large areas, 4 lb. of lead arsenate in 50 gals. of water proved to be an efficient spray. The injury anticipated from its increase in numbers was prevented by the appearance of the small egg-parasite *Telenomus dilophonotae*, Cam. Up to the present *Hevea brasiliensis*, as grown in

British Guiana, has shown itself to be peculiarly free from insect attack, but the following insects, principally COCCIDAE, have been observed to attack it in the Colony :—*Erinnyis ello*; *Tropidacris cristata*, and an undetermined Locustid; *Empicoris variolosus*, L.; *Asterolecanium pustulans*, Ckll., *Vinsonia stellifera*, West., *Saissetia nigra*, Nietn., *Aspidiotus destructor*, Sign., *Aspidiotus* (*Chrysomphalus*) *personatus*, Comst.

The caterpillars of *Brassolis sophorae* still continue to damage coconut palms in all parts of the Colony, as trouble is seldom taken to apply the comparatively easy control measures recommended. Other pests are a large black Dynastid beetle (*Strategus aloeus*, F.); *Aspidiotus destructor*, which is easily controlled by kerosene emulsion and is preyed upon by *Cryptognatha nodiceps*, Mshll., and *Azya trinitatis*, Mshll.; and the palm weevil, *Rhynchophorus palmarum*, L. The following list is given of the insects injurious to coconut palms in British Guiana :—*Castnia licus*, *Castnia daedalus*, *Sibine trimacula*, *Brassolis sophorae*, a Hesperid butterfly; *Strategus aloeus*, F., *Rhynchophorus palmarum*, L., *Metamasius hemipterus*, L., *Dyscinetus bidentatus*, *Rhina barbirostris*; *Aspidiotus destructor*, Sign., *Vinsonia stellifera*, Westwood; *Cerataphis lataniae*; *Aleurodicus cocois*, *Aleurodes* sp.

Citrus plants cultivated in suitable soils have been singularly free from the attack of insects, particularly of COCCIDAE. This is due to the heavy rainfall and the presence of parasitic fungi such as *Cephalosporium lecanii* and *Sphaerostilbe coccophila*. Where the plants are poorly cultivated in the heavy clay soils of the coastlands, they are attacked by many scale-insects, as many as six distinct species often occurring on a single tree. An accompanying black blight is characteristic of scale attack. A list of these Coccids is given [see this *Review*, Ser. A, ii, p. 416]. On several occasions the caterpillars of *Papilio anchisiades* defoliated orange trees.

Cacao was attacked by *Pseudococcus citri*, Risso, *Heliothrips rubrocinctus*, Giard, *Horiola arcuata*, F., and Coffee by *Saissetia hemisphaerica*, Targ., *Coccus hesperidum*, L., *Selenaspidus articulatus*, Morg., *Saissetia oleae*, Bern., *Ischnaspis longirostris*, Sign. (*filiformis*, Doug.)

ANDERSON (T. J.). **Report of the Entomologist.**—*Ann. Rept. Dept. Agric. Br. East Africa, for 1912-13, London,* 1914, pp. 124-131.

During the period under review no severe outbreak of insect pests occurred, but several new ones have been discovered and the old ones were more or less abundant.

Lamellicorn beetle larvae did more than the usual amount of damage, especially on badly cultivated land. As the roots of bush and grasses form the natural food of these pests, clean cultivation and the removal of wild grass, &c., near the crops is an obvious remedy; fallow land should also be frequently cultivated in order to keep down wild food plants and thus starve out the grubs. The adult beetles fly by night and destroy the foliage of trees and bushes, especially of vines and fruit trees. In the daytime they may be found round the stems of the plants 1 to 3 inches below the surface. They may be readily dug up and destroyed, and a boy, who had been shown how to collect, brought in 500 in one day. *Schizoneura lanigera* has been found in new localities, possibly imported with the soil attached to nursery

stock and thus escaping detection by the plant inspectors. The injection of carbon bisulphide into the soil and spraying or painting the bared roots with strong tobacco decoction proved satisfactory remedies. A Rule under the Diseases of Plants Prevention Ordinance has been drafted to prohibit the importation of apple trees other than those grafted on the immune Majetin or Northern Spy stocks. Cutworms have given great trouble, especially in tobacco plantations, and though, by removing the attacked plants and filling their places with others, the pests are kept down, the result is an uneven crop which causes trouble at harvest time. Poisoned bran baits, frequent stirring of the soil and the collection of the caterpillars have proved useful.

The wheat aphis, *Toxoptera graminis*, comes and goes on wheat in a manner difficult to explain ; it was very abundant during the year under report, but disappeared almost completely in a very short time after a shower of rain.

*Anthores leuconotus*, the white coffee borer, perhaps the worst enemy of coffee in Africa, is only known at present in one locality in the Protectorate—at the Bura Mission, about 25 miles from Voi, on the Voi-Taveta road. The locality is isolated and no other coffee is grown in the near neighbourhood. The author refers for remedies to Morstatt's report on pests of coffee [see this *Review*, Ser. A, i, pp. 104-108]. *Apate monacha*, F., has been reported from one or two plantations, in each case near the forest from which the pest has spread to the coffee. Pruning, burning the prunings and the injection of carbon bisulphide into the boreholes when these occurred in the stem sufficed to keep this Bostrychid beetle in check. The carbon bisulphide apparently had the effect of making all dormant buds develop. *Apate* also attacks wattle, Casuarina and Grevillea. The following beetles are numerous and have done some damage by eating the leaves of coffee. *Pachnoda sinuata*, F., *Adoretus punctipennis*, Fåhr., and *A. pagensteckeri*, Gerst., *Anomala kersteni*, Gerst., species of *Schizonycha*, *Camenta* and *Dicasticus* and *Systates cribripennis*, Fairm. *Antestia variegata*, Thunb. var. *lineaticollis*, Stål, occurs in all coffee plantations, and though the damage as yet done is small the possibilities are serious if it is not kept in check. The author says that the remedies suggested by Morstatt (*loc. cit.*) are practically useful. *Sphaerocoris ocellus*, Klg., *Agonoscelis puberula*, Stal., *Bagrada picta*, F., and *Nezara* spp. are common bugs and are to be regarded as potential pests. The locusts, *Phymateus superbus* and *Zonocerus elegans*, are plentiful, and have been found eating the leaves of coffee. The scale-insects attacking coffee are *Lecanium africanum*, Newst., *Coccus viridis*, Green, *C. hesperidum*, L., *Ceroplastes* sp., and *Pseudococcus citri*, Risso. The larvae of *Ceratitis capitata*, Wied., feed on the pulp of ripe or over-ripe berries, but are killed during the pulping. They are hardly to be regarded as a pest. *Leucoptera* (*Cemiostoma*) sp. is found wherever coffee grows, but is only a minor pest.

Tobacco has been damaged by the split worm or leaf miner (*Phthorimaea heliopa*, Lwr.), which spoils "wrapper" leaf. The moth greatly resembles the potato tuber moth, and the author thinks that it was possibly introduced with seed potatoes. The pupal

stage averages only five days, so that there are several generations during the growth of the crop. The lower leaves are chiefly attacked, and each larva may be responsible for several blotches on one leaf. When the tobacco is flue-cured the caterpillars are killed, but when air-cured, quantities are to be found hanging to it by silken threads. The moths hide in the barns, or among tobacco stems and rubbish on the field left after harvest. This should be collected and burned, and when the plants are pulled up the earth clinging to the roots should not be shaken off, but thrown on to the fire ; many pupae will thus be destroyed.

*Papilio demodocus* is common on all citrus trees, the chief damage being done to young plants. Handpicking or, in the nurseries, spraying with arsenate of lead, is efficacious. The Citrus Aphis does a great deal of damage to young shoots and leaves, retarding growth and distorting them. Spraying with a decoction of the locally grown tobacco is an effective method of control. The Citrus Psylla (*Trioza* sp.) is found all over the Protectorate and, though not a serious pest, damages young shoots and leaves. It is kept in check by natural parasites, and the larvae may be killed by spraying with tobacco, soap, or kerosene emulsion. *Lepidosaphes beckii*, Newm., and *Icerya purchasi* have been reported on citrus, the latter also on wattle, lemon, orange, roses and grass.

The following Aphids are recorded :—*Macrosiphum lophospermum*, Theo., sp. n., from *Lophospermum erubescens* (*Maurandia barclayana*) ; *M. lycopersicella*, Theo., sp. nov., from Cape Tomato ; *M. antirrhinum*, Macchiate, from *Antirrhinum*. *M. granarium*, Kirby, from broomcorn (sorghum) ; *Rhopalosiphum lactucae*, Kalt., from *Sonchus* ; *Aphis gossypii*, Glover, from cotton ; *A. tavaresi*, Del Guer., from orange trees ; *A. solanella*, Theo., sp. nov., from *Solanum* sp. ; *A. africana*, Theo., sp. nov., from broomcorn (sorghum) and barley ; *Toxoptera graminum*, Rond., from wheat.

Rhumbler (L.). **Die Buchenrinden-Wollaus** (*Cryptococcus fagi*) **und ihre Bekämpfung.** [The Felted Beech Coccus and its control.]— J. Neumann, Neudamm, n.d., 32 pp. ; price 20 Pfennige.

So far, records have been made of over 500 trees attacked by this scale in the Münden districts of Gahrenberg and Cattenbühl. It usually hibernates as a wool-covered larva, firmly fixed to the bark. From April to June the larvae transform into perfect insects and oviposition begins, several batches of eggs being laid by each female up to the end of October. During August and September hatching requires only 25 to 26 days in the laboratory ; in September and October 45 to 50 days are necessary in the open air. The strong-legged young larvae are able to travel over the smooth bark, and their rate of progress increases at higher temperatures, a 6-foot climb being possible on a warm afternoon. After wandering for some time the larva fixes itself definitely. Occasionally wax is produced before this, but as a rule the secretion only begins after attachment. The ambulatory larva is responsible for the spread of infestation on a given tree, but the dispersal from one tree to another is due to the wind-borne waxy secretion containing eggs. The dangerous months are from June to November inclusive, September

and October being the worst. Reproduction appears to be almost exclusively parthenogenetic, as males only occur very rarely. In order to ascertain the number of larvae carried by the wind in a given time, over a given distance, glass slabs covered with bird-lime were used. Beeches are infested at all periods of their existence, and the universal occurrence of the pest makes the treatment of single trees useless. Experiments, still in progress, show that a female lays at least 15 eggs, which should give rise to 50,625 females in 4 years. In spite of this only a slight increase is usually visible after 6 years, and investigation shows that this is due to the fact that they seldom survive when the host tree is in normal health. The scales avoid very soft, tender and "corky" bark, and also trees which *Limax arborum* has cleared of their covering of lichen and *Protococcus pluvialis*. Scrubbing is therefore a measure of some value. An outbreak is only an increase of existing scale infestation due to the trees suffering injury from other causes, as shown by the fact that a healthy tree will remain uninfested, though growing close to a severely infested one. The observations of many years prove that the trees are not killed by scale infestation alone, and on trees which have died subsequently to such infestation brown or brown-black spots occur on the trunks, which exude a fluid. These are probably not caused by *Cryptococcus fagi*, and the author thinks that they are due to a hitherto unknown fungus. *Leptis* and other flies suck the fluid from these spots and possibly act as carriers. The death of the trees is hastened by various pests, first *Xylotecus domesticus*, then *Lymexylon dermestoides*. *Nectria ditissima* and other fungi follow. The author considers the chief enemies concerned in the destruction of the beech to be the agent causing the spots and *Nectria ditissima*. Neither of these is at present controllable, but *Cryptococcus fagi*, which undoubtedly injures the tree, should not be neglected. When attacks of the three pests occur in less than 10 per cent. of the trees the axe is perhaps the best remedy. In more severe infestations the scales may be energetically brushed off the bark, and if over 20 per cent. of the trees are attacked they should be sprayed with Schacht's Fruit-tree Carbolineum, 1 part in 4 parts of water, or painted with a solution made up of 1 part and 5 parts water, at an estimated cost of about 22*s*. per acre.

MOTE (D. C.). **The Cheese Skipper** (*Piophila casei*, **L.**).—*Ohio Nat., Columbus*, xiv, no. 7, May 1914, pp. 309-316, 1 pl.

The cheese skipper (*Piophila casei*, L.), so called on account of the peculiar leaping habits of the larva, is of considerable economic importance to man on account of its attacks on cheese, smoked meats, etc., and its possible relation to myiasis. The fly deposits its eggs upon bacon, cheeses, smoked ham, slightly putrid meat, etc. The duration of the egg stage is 23-54 hours, and of the larval period 14 days. Pupation occurs in drier places than those in which the larvae feed and occupies 12 days. The flies, in an experiment, seemed to prefer beef-steak with a slightly putrid odour for purposes of oviposition. The adult flies lived longer and the larvae fed and matured more readily on this than on other foods. The anatomy of the larva and adult fly is described.

LATHROP (F. H.). **Egg-laying of the Rice Weevil,** *Calandra oryzae*, **L.** —*Ohio Nat., Columbus*, xiv, no. 7, May 1914, pp. 321-327, 5 figs.

The rice weevil, *Calandra oryzae*, L., well known throughout the United States as a pest of stored grain, is in the South especially destructive to maize. An account is given in the present paper of the egg-laying habits of this weevil, which are of a highly adaptive character and may be of economic importance. The eggs are deposited in such a position that the larvae are surrounded by an abundance of food, and are protected during the helpless period of life. By being laid beneath the surface of the grain, the eggs are protected to a large extent from external injury, excessive drying and sudden changes of temperature. The cavity in which the eggs are laid is sealed by the mother with a plug, which is probably useful against predaceous and parasitic enemies and is incidentally a safeguard against gases used in fumigation. In spite of this plug, numerous instances were observed in which the predaceous mite, *Pediculoides ventricosus*, Newp., successfully attacked and destroyed the eggs and larvae, as well as the adult weevils.

FAURE (J. C.). **Sweet-Potato Sphinx.**—*Agric. Jl. Union S. Africa, Pretoria*, vii, no. 4, April 1914, pp. 515-519, 1 fig.

The sweet-potato industry in the New Hanover-Dalton District in Natal has increased so rapidly in recent years that there are probably 2,000 acres of this crop annually of a gross value of about £20,000. The larvae of the sweet-potato moth (? *Herse convolvuli*, L.) seriously defoliates the crop, reducing it by from 25 to 50 per cent. Growers maintain that there may be three separate attacks in a season—in November, January and March.

The eggs are laid singly on the under side of the leaves, pupation taking place in the soil. A Tachinid parasite has been reared from the larvae, and also a Chalcid which may be a hyperparasite. Spraying experiments were undertaken, small plots being sprayed with arsenate of lead (3 lb. to 50 gallons), and Paris green (1 lb. to 75 gallons and 2 lb. lime), both sprays being sweetened. From 30-80 per cent. of the larvae were killed and the sprayed plots were largely avoided by migrating caterpillars.

VAN DER WALT (J.). **Lime for Green Aphis.**—*Agric. Jl. Union S. Africa, Pretoria*, vii, no. 4, April 1914, pp. 576-577.

In the spring of 1911, the author had four peach trees very badly infested with green aphis. The trees were thoroughly wetted and unslaked lime powdered over them in the morning; the same afternoon the trunks of the trees were green with insects that had left the branches. A few days later the trees were quite clean and began to grow again. In 1912 the whole orchard was treated in this way, and in 1913 not a single aphis was to be found. For trees about 6-8 feet high 3 lb. of lime per tree was used. This treatment is cheaper than the nicotin treatment.

Thomsen (F.). **Locust Birds.**—*Agric. Jl. Union S. Africa, Pretoria,* vii, no. 5, May 1914, pp. 682-683.

During the campaign of February and March 1914, against *Locusta pardalina,* the various locust-birds were very scarce. *Ciconia alba,* the European stork, usually the most important factor, rendered no help at all, and none of the small locust-birds (*Glareola melanogaster*) were seen. The wattled starling (*Dilophus carunculatus*), although doing good work among swarms, does not follow the locusts into the open veld or dry mountainous country, and fruit gardens proved a greater attraction than the locusts, havoc being played with ripe figs and grapes. It is during the nesting season that this starling does its best work among the voetgangers. Other birds mentioned as being of minor importance in locust-control are the spreuw (*Spreo bicolor*), the korhan or pouw, the blue crane, larks, finches and a glossy starling.

**Locust Destruction in the Cape Midlands.**—*Agric. Jl. Union S. Africa, Pretoria,* vii, no. 5, May 1914, pp. 706-708.

Locusts were unexpectedly numerous this spring, and appeared on ninety farms instead of on three, where eggs were known to have been deposited. In spite of control measures, it was estimated that 10 per cent. developed to the winged stage; the flying swarms spread over a great area and laid eggs almost at once. The brown locust (L. *pardalina*) was heretofore supposed to be single-brooded, but the laying of eggs at midsummer led the Department of Agriculture to expect a second generation and accordingly special field work was undertaken against this generation by Mr. F. Thomsen. On 134 farms, 768 swarms, estimated at 389,000,000 insects were destroyed.

Scott (E. W.) & Paine (J. H.). **The Lesser Bud-Moth.**—*Jl. Agric. Research, Washington, D.C.,* ii, no. 2, May 1914, pp. 161-163.

During the spring of 1912 the work of a small lepidopterous larva was noticed in the buds of unsprayed apple trees. In a neglected orchard near the laboratory this insect was the most important factor in the destruction of the entire crop of fruit. The species proved to be *Recurvaria crataegella,* Busck, which the authors suggest is a synonym of the European *R. nanella,* Hübn.

Guppy (P. L.). **Birds and their Value to the Agriculturist.**—*Bull. Dept. Agric., Trinidad and Tobago, Port-of-Spain,* xiii, no. 80, May 1914, pp. 148-156, 4 pls.

The author states that, with a few exceptions, birds play an insignificant part in the control of harmful insects in Trinidad, and that far more work is done in this direction by parasites and predaceous insects. The following insects are abundant in localities where birds are plentiful:—Cotton stainer (*Dysdercus howardi*), corn bud-worm (*Laphygma frugiperda*), tobacco horn-worm (*Protoparce sexta*), tobacco bud-worm (*Chloridea virescens*), cutworms (*Prodenia* spp.), striped cane looper (*Remigia repanda*), sugar-cane bud-worm (*Cirphis humidicola*), froghoppers (*Tomaspis* spp.), etc. Some birds are undoubtedly harmful, such as grass birds, doves, the little black corn-bird (*Molothrus*

*atronitens*) and the soldier bird (*Leistes militaris*), which damage rice, and parrots, tanagers and others which injure fruit crops; none of these are insectivorous. The wren (*Troglodytes rufulus*) is useful in gardens and orchards in eating harmful insects, but is itself preyed upon by the oat bird. Hymenopterous parasites, Tachinid and Syrphid flies play the most important part in controlling insect pests in Trinidad. One of the most valuable Hymenopterous parasites is *Anagrus flaveolus*, which preys upon the eggs of the corn-leaf hopper (*Peregrinus maidis*), destroying 75–80 per cent. The cotton worm (*Alabama argillacea*) is efficiently held in check in Trinidad by Tachinid flies (*Phorocera* sp.), while Syrphid flies reduce the numbers of Aphids, Coccids and froghoppers.

Dalmasso (G.). **I risultati d'un primo anno di lotta organizzata contro le tignuole dell'uva in Piemonte.** [The results of a first year of organised combat against the vine moth in Piedmont.]—*Riv. Vitic. Enol. Agrar., Conegliano*, xx, no. 9, 1st May 1914, pp. 193-197.

In the vine-growing districts of Piedmont, *Polychrosis botrana* is much more numerous than *Clysia ambiguella*. In 1913, the spring and summer generations were injurious, but the autumn or third generation did little harm, as the caterpillars appeared after the vintage. Weather conditions explain this fact, which supplies the key to an apparent anomaly in the behaviour of *Polychrosis*, which sometimes destroys a large portion of the grapes a few days before the vintage and at other times ceases to be injurious at this period. Nicotin, as a controlling agent, was chiefly adopted and its effects varied very considerably. This variation is due to the modes of application and to the inconstant composition of nicotin in Italy. The campaign is to be renewed in 1914, and the author suggests that it should be prepared for by cleaning the vines, arranging shelter traps and disseminating parasites. The latter object may be attained by placing infested grapes in pans covered with fine wire gauze which will allow the parasites only to escape. The author dissents from the statement —made in the report on the campaign—that arsenate of lead is the best insecticide to use against the first generation.

Schouteden (H.). **Les Orthoptères nuisibles aux Plantations en Afrique.** [Orthoptera harmful to plantations in Africa.]—*Rev. Zool. Afric., Brussels*, iii, no. 3, 25th May 1914, pp. 464-470, 2 pl.

Among the most harmful African Orthoptera are *Zonocerus variegatus* and *Z. elegans*, which are widespread in both East and West Africa; *Z. elegans* is found as far east as Madagascar; in the Congo *Z. variegatus* is the more common species. The damage these insects do is rendered greater by the wide range of plants, such as rubber, cacao, coffee, cotton, etc., which they attack. In East Africa, the larvae of *Z. elegans* appear in October and the adults in January. In Nigeria, the larvae of *Z. variegatus* appear in October and are to be observed as late as the following March. The best method to combat *Zonocerus* seems to be to catch the insects directly in nets, and drop them into vessels containing water with a layer of petroleum on the surface. The best time to do this is just before the appearance of the adults.

Degrully (L.). **Sulfatage et charette à transformation.** [Spraying and a convertible cart for carrying spray solutions.]—*Progrès Agric. Vitic., Montpellier,* xxxi, no. 19, 10th May 1914, pp. 579-580, 1 fig.

The author describes an apparatus patented by M. Edmond Blanc, which permits of large quantities of liquids being transported by one man without other help, and comprises a cart, a loose frame and a barrel. The tailboard and bottom of an ordinary two-wheeled farm cart are removed and iron slides fitted underneath its body. By means of chains and pulleys worked by a windlass the axle may be shifted along the body so that equilibrium may be maintained with varying loads. The square metal frame is placed on the ground between the wheels. It can be raised horizontally off the ground by means of the chains, to which its four corners are secured. The barrel stands on two very thick and solid battens fixed on its bottom. For loading, the cart is backed until its body encompasses the barrel, the frame is pushed underneath the latter and a few turns of the windlass will raise the barrel off the ground, a wooden post fixed on the cart keeping the barrel upright. By slackening the windlass the barrel may be readily lowered to the ground.

Stratford (G.). **Cherry-Culture.**—*Jl. Agric., Wellington, N.Z.,* viii, no. 5, 20th May 1914, pp. 480-495.

The only insect pest of any importance that attacks the cherry in New Zealand is the pear or cherry slug. It is a sawfly larva, black and slimy in appearance, about $\frac{3}{8}$ inch long, and resembling a small garden slug. It feeds on the upper sides of the leaves, and if unchecked does serious injury to the trees, but is easily controlled if sprayed with hellebore or arsenate of lead without delay.

Attwater (H. P.). **Use and Value of Wild Birds to Texas Farmers and Stockmen and Fruit and Truck Growers.**—*Bull. Texas Dept. Agric., Austin,* no. 37, May-June 1914, 61 pp., 16 figs.

This bulletin has been compiled with a view of furnishing information to farmers on the economic value of wild birds in regard to agriculture in Texas, and contains accounts of a large number of species found in that State which are in danger of being exterminated for purposes of sport or on account of the damage they are supposed to do. Investigation made by the Department of Agriculture has shown that 53 per cent. of the food of the birds in one locality was found to consist of the larvae of disease-disseminating mosquitos. Horse-flies are also the natural food of several species of birds. The fever tick, injurious to cattle, is the food of the kildeer and the plover. Maize, cotton and other crops are destroyed to a large extent by grasshoppers, and there are at least twenty-three species of birds that feed upon these. The cotton boll-weevil is eaten by the plover, kildeer and other birds. The damage which birds may cause is insignificant compared with the good they do in controlling insect pests, and the artificial conditions which arise from the opening up of uncultivated land for agricultural purposes can only be made up for by encouraging birds to eat the insects which destroy the crops.

## NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

## CONTENTS.

CONTENTS—*continued.*

VOL. II. Ser. A. Part 10.—pp. 577-624. OCTOBER, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.



LONDON:

SOLD BY

DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.




*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

E. S. **Il metodo Lotrionte e le Api.** [Bees and the Lotrionte control of the olive fly.]—*Riv. Agric., Parma*, xx, no. 19, 8th May 1914, p. 297.

In reply to an enquiry by the author, Professor Lotrionte declares that careful experiments have proved conclusively that the poison mixture used in the "capannette" [see this *Review*, Ser. A, ii, p. 479] does not attract bees, even if their hives are only a few yards distant.

Picard (F.). **Les insectes de la luzerne.** [Pests of lucerne.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 18, 3rd May 1914, pp. 555-561, 1 pl.

In the South of France the habits of *Hypera* (*Phytonomus*) *variabilis* are the same as in the United States [see this *Review*, Ser. A, ii, p. 294]. The injury it does is only inferior to that caused by *Colaspidema atrum*, which is usually a pest of the second crop, *H. variabilis* being chiefly a pest of the first. The larval stage lasts about 50 to 60 days. Hibernation is probably due to dehydration rather than to cold. Besides lucerne, certain vetches, melilot, etc., are the only plants attacked. In France the following enemies keep this weevil under control:—The predaceous mite, *Pediculoides ventricosus*, a small Mymarid of the genus *Anaphes*, several Pteromalids, *Canidiella curculionis* and *Itoplectis masculator*. Many larvae and pupae are also destroyed by a fungus, *Entomophthora sphaerosperma*. The larvae of *Hypera nigrirostris* and *H. punctata* attack lucerne in the same manner, but to a less degree, owing to their smaller numbers. Lucerne should be cut when oviposition is nearly completed and sheep grazed on the fields for a fortnight afterwards, many adults and larvae being destroyed thereby. Dusting with lime—which dries up the larvae—has sometimes given good results. Lucerne should not be grown for more than 8 consecutive years in much infested localities. In spite of its name, the small weevil, *Apion pisi*, chiefly attacks vetches and lucernes. The larvae live in the pods of the vetches, where they destroy the seed, but on lucerne they live in the floral buds before the flower is formed, and are therefore only injurious to plants raised for seed. Though *A. trifolii* is often found on lucerne, little is known of the cause of its presence there. *Colaspidema atrum* has recently been studied by A. Lecaillon [see this *Review*, Ser. A, ii, p. 203]. Hopperdozers are very useful before oviposition takes place, and poultry, if allowed to run on the fields, will give further assistance. If the first crop is cut early in spring the larvae will perish owing to the lack of tender leaves. A useful control method is that of Solanet [see this *Review*, Ser. A, ii, p. 58]. The injury caused by *Subcoccinnella 24-punctata* is often important, but never comparable to that of *H. variabilis* or *C. atrum*. Control measures adopted for the latter are also applicable here. The butterflies, *Colias edusa* and *C. hyale*, are common in fields of clover, sainfoin, lucerne, etc. Owing to the green colour of the larvae, agriculturists seldom notice them and rarely complain of the damage which must be done by insects occurring in such numbers. So far, only one parasite, *Diglochis omnivora*, a small Chalcid which oviposits in the *Colias* egg, has been reported. The author has, however, found the larva of *Amblyteles homocerus* in the *Colias* caterpillar, and the wasp, *Eumenes arbustorum*, is known to carry off this

(C76) Wt.P16/57. 1,500. 10.14. B.&F. Ltd. Gp.11/3. A

caterpillar as food for its own larvae. A fly, *Agromyza nigripes*, oviposits under the epidermis of lucerne leaves. The larvae bore into the parenchyma and a whitish spot appears on the leaf. The best control measure is to cut the lucerne on the appearance of the spots before the larvae abandon the plant to pupate in the soil, thus preventing subsequent generations.

Severin (H. H. P.) & Severin (H. C.). **Behaviour of the Mediterranean Fruit Fly** (*Ceratitis capitata*, **Wied.) towards Kerosene.**—*Jl. Animal Behaviour, Boston*, iv, no, 3, May-June 1914, pp. 223-227.

In experiments made to determine the effect of kerosene on the Mediterranean Fruit Fly (*Ceratitis capitata*) in Honolulu, Hawaii, pans 3½ inches deep and 12 inches in diameter were fastened to the lower branches of fruit trees. It was found that the colour of the pan made no difference to the number of flies caught. The trees experimented with were guava, navel-orange and Java plum; of these the largest number of flies were caught in the pans on the Java plum, and the smallest on the guava. The kerosene was found to attract the males almost exclusively, the number of females trapped being only about 3 per 1,000.

Fletcher (T. B.). **Note on the Green Scale of Coffee** (*Lecanium viride*).—*Coorg Gaz. Press, Mercara*, 1st June 1914, 3 pp.

The green scale of coffee, *Coccus viridis* (*Lecanium viride*), is generally found near the tips of branches, either clustered in masses along the tender parts of the twigs or on the leaves. It damages the plant by sucking the juices by means of its thread-like mouth-parts; when the scale is present in large numbers the drain on the plant juices is considerable, and the plant may in severe cases be killed outright. The green scale was introduced into Coorg a year ago and has spread throughout North and South Coorg, and has hitherto only been found on coffee. The young scale is able to move fairly freely, and dispersion is aided by ants, which seek out the scales for the sake of the honey-dew yielded by the insect. When their excretion falls on leaves a black, sooty fungus grows on it, and though this may be due to other insects also, it serves as one of the means of recognising the presence of scales.

The life-cycle of the scale has not been worked out in Coorg, but it is probably quite short, a month or less. The females reproduce parthenogenetically, the male being unknown; incubation occurs within the body of the parent, and the increase is very rapid. No practical means for the extermination of the pest have been devised; the best means of checking the spread consists of spraying the plants with a contact insecticide, made as follows:—One pound of ordinary washing soda is boiled in one gallon of water, and to the boiling solution are added two pounds of finely powdered fir-tree rosin; the solution is boiled, small quantities of cold water being added at intervals, until the liquid (now about three gallons) becomes clear and thin, like clear coffee. This is diluted to about one part of the rosin compound to six of water, the dilution being made whilst the mixture is still hot. The addition of soap makes the mixture more effective; for brushing,

sufficient soap must be added to give the requisite lather. In spraying, the under surfaces of the leaves must be given special attention. Brushing is probably equally efficient for killing the scales, but is much slower; it is therefore more suitable for small areas, as in the case of small holdings where the owners do the work themselves and cannot afford sprayers. Pruning the affected bushes and burning the prunings, and also burning the scales on the bushes by means of a blow-lamp, have been tried, but are not recommended. Treatment should be carried out more than once, in order to destroy scales that escape the first time. Further attention is being directed to the question of the natural enemies of the green scale, which at present seems fairly exempt.

MORSTATT (H.). **Die Schädlinge der Baumwolle in Deutsch-Ostafrika.** [Cotton pests in German East Africa.]—*Beiheft zum Pflanzer, Dar-es-Salaam,* x, no. 1, 1914, 50 pp., 3 pls.

A descriptive list is given of the following insect-pests of cotton in German East Africa :—

The winged swarms of *Schistocerca peregrina*, Oliv., have not been troublesome up to now, and *Zonocerus elegans*, Thunb., has been recorded once only, from Tabora, where masses of young hoppers attacked the leaves from October to December. The latter locust is of less importance, because it usually occurs only from October to April, when cotton is not at its period of maximum growth, and moreover the egg-clusters in the soil are mostly destroyed by cultivation.

Amongst the Coleopterous pests *Popillia hilaris*, Kraatz, is common in Usambara, where it feeds on the cotton leaf; the wheat beetle, *Tenebrioides* (*Trogosita*) *mauretanicus*, is found in the seed, as also is the biscuit beetle, *Laemophloeus pusillus*, F., while the saw-toothed grain beetle (*Silvanus surinamensis*, F.) occurs in imported seed. The lady-birds, *Epilachna similis*, Thunb., *E. matronula*, Wse., and *E. polymorpha*, Gerst., occasionally injure the leaves, and *Alesia striata*, F., is also found on cotton, but is a useful insect, as it feeds on aphids. *Apate monachus*, F., was noticed only once on Egyptian cotton at Bagamoyo and a smaller beetle of the same family, often seen at Kilossa, only occurred on dying plants. Kränzlin records a small brown Elaterid as causing injury to young plants, while the Buprestid *Sphenoptera neglecta*, Klug, which is closely related to *S. gossypii*, Kerr., and native to German East Africa, has not yet been found injuring cotton, though it does so in the Sudan. *Mylabris bizonata*, Gerst., feeds on the leaves, and the numerous species of Chrysomelids only occasionally increase so as to be economically important. According to Kränzlin, *Syagrus puncticollis*, Lefèvre, feeds by night on the stems of quite young plants, causing them to give way at the injured spot; it also attacks the leaves. The appearance of the beetle coincides with that of the heavy rains, and development is believed to take place in the soil. Captive individuals refused Upland cotton, offered instead of Egyptian. Efficient control was obtained by collection and the subsequent destruction of the insects in water to which some petroleum had been added. A beetle attacking the enveloping leaves of immature cotton bolls is believed to be *Ootheca mutabilis*, Sahlb. *Apion xanthostylum*, Wagn., is a most dangerous cotton pest, damaging

the entire plant. Zimmermann discovered it in October 1910, at Morogoro, where it has since increased, but fortunately has not spread to any extent and only occurs elsewhere at Amani. This weevil bores into the green bolls and stems, where it oviposits. The larvae excavate galleries and a chamber in which they pupate, and kill the plants in severe cases. Another species, *A. armipes*, Wagn., found in West Usambara, attacks the stem and branches, but apparently not the bolls. The plants should be burnt when the crop has been gathered, which should be done as early as possible. *Alcides brevirostris*, Boh., is found in all districts and rings the stems, usually near the ground. One portion of the ring is very much widened and the egg is laid there. This ringing is done in May, or later, and the injury becomes apparent about four months after sowing ; all infested stems must be cut off beneath the ring and burned. Among other weevils, *Dicasticus gerstaeckeri*, Fst., and *Systates pollinosus*, Gerst., are very occasionally found on cotton ; *Epipedosoma laticolle*, Kolbe, occurred in numbers on cotton on Kilimandjaro.

Lepidopterous cotton pests include the spiny boll worm, *Earias insulana*, Boisd., which has not been reported recently except from near Kilossa and Morogoro, where it has lately appeared in numbers. *Hibiscus esculentus* and *H. cannabinus* should not be allowed to grow near cotton, as they also are hosts of this species. *Earias biplaga*, Walk. (*plaga*, Feld.) was found in a cotton field in Mombo, but nothing further is known about it. The Egyptian cotton worm, *Prodenia litura*, F., is found in East Africa, where the caterpillars are observed in the green bolls; the caterpillars of *Porthesia producta* have been frequently noticed, but do little injury to the leaves ; *Chaerocampa celerio*, L., was once observed in Mombo in May, its caterpillars appearing in numbers and stripping the cotton plants bare ; a small Saturniid caterpillar destroyed about 10 acres of cotton in the Dar-es-Salaam district ; *Sylepta derogata*, F. (*Synclera multilinealis*, Guené), has not been much noticed of late years and does only slight injury ; *Ephestia cautella*, Walk. (*E. cahiritella*, Zell.), was found in cotton seed. The pink boll worm, *Gelechia gossypiella*, Saund., is still the most dangerous enemy of cotton in East Africa. Although no wild food-plants have as yet been discovered in the colony, this insect appears to be native, but may have been imported with foreign seed. Control measures are the same as advised for *Apion armipes*. An undetermined species of *Gelechia* has been observed by the author feeding on cotton leaves in the centre and south of the colony. *Pyroderces simplex*, Wlsm., seems to occur in all districts, being sometimes more plentiful than *G. gossypiella*. The author states that the larvae are not merely rubbish-feeders, but do as much damage to the seed as do those of *Gelechia*. Light-traps appear to be of some use in this case. *Setomorpha insectella*, F., was found in old cotton seed.

Amongst the Rhynchota, eight species of *Dysdercus* are native to the country, and four of these occur on cotton, viz., *Dysdercus cardinalis*, Gerst., *D. fasciatus*, Sign., *D. nigrofasciatus*, St., *D. superstitiosus*, F. These bugs may be shaken down into a sheet and killed in water containing petroleum, and the collection may be facilitated by the use of baits, such as piles of cotton seed. *Phonoctonus fasciatus*, P. de B., is a natural enemy, but has little value, especially as the stainers are of only slight importance. The Lygaeid, *Oxycarenus*

*hyalinipennis*, Costa, is scarcely a pest, but it occurs in large numbers in cotton which is being ginned, and the staining due to the crushed insects may prove a source of loss. The Pentatomids, *Calidea apicalis*, Schout., *Hotea subfasciata*, Westw., and *Hotea* sp., occur in the colony, and the Coreid, *Serinetha hexophthalma*, Thunb., is occasionally found on cotton, while the Mirid, *Helopeltis bergrothi*, Reuter, was noticed at Amani. Many species of JASSIDAE occur on cotton, *Chlorita facialis*, Jac., being the species most frequently caught in the Mombo light-trap trials. Direct control seems impracticable, but the brothers Pentzel state that these insects avoid plants visited by ants, and advise the retention of a fallow strip along the sides of a cotton field, which ants will occupy. The author believes that *Aphis sorghi*, Theo., is the species responsible for the Mafuta disease, which is usually without serious consequences to the crop. An exception to this was noticed by the author in 1913 in the Kilwa district, where it appears to have ruined the crops. Spraying with nicotin-soap or petroleum emulsion seems to be the only method of control. *Alesia striata* and *Chilomenes lunata*, F., are natural enemies. The COCCIDAE observed in German East Africa on cotton are: *Pseudococcus* (*Dactylopius*) *citri*, Risso, *Pseudococcus* (*Phenacoccus*) *obtusus*, Ldgr., *Pseudococcus filamentosus*, Ckll., *Hemichionaspis* (*Pinnaspis*) *minor*, Mask., *Saissetia* (*Lecanium*) *nigra*, Nietn., and undetermined species of *Eriococcus*, *Lecanium* and *Pulvinaria*.

The author concludes by referring to the disinfection of cotton seed, the agents mentioned being carbon bisulphide, carbon tetrachloride, naphthalin, corrosive sublimate or seawater. The seed should be disinfected as soon as it arrives at the buyer's plantation and stored separately from non-disinfected seed in a dry, airy place, not on the ground; carbon bisulphide or carbon tetrachloride are the best disinfectants, and to protect the seed from future infestation 1 per cent. of naphthalin should be mixed thoroughly with it. Where it is impossible to keep the store-rooms free from infected seed, disinfection may be carried out immediately before sowing by immersing the seed in water containing 1 per 1000 of corrosive sublimate, the mass being well stirred. After half an hour the liquid should be strained off, and the seed rinsed and planted without delay. Wooden containers must be used, as alloys are formed if metal comes in contact with the solution.

SMITH (R. E.), HUNT (T. F.) & NIXON (W. H.). **Spraying Walnut trees for Blight and Aphis Control.**—*Cal. Univ. Agric. Expt. Sta., Berkeley*, Circular no. 107, Oct. 1913, 8 pp. [Received 18th Sept. 1914.]

In the experiments described in this circular, promising results in the destruction of aphids were obtained and there is reason to believe that blight may be controlled, to some extent, by the same means. The best results were obtained by spraying the trees while in a dormant condition, or just after the first growth was starting, with lime-sulphur solution. The proportion used consisted of 1 gallon of commercial lime-sulphur to 19 gallons of water. Twenty-five pounds of quicklime, slaked and strained, were also added in order to make the spray more visible upon the trees. The problem of spraying large trees

quickly and economically was met by the use of high power and a special nozzle (the M.A.C.), making it possible to cover the largest trees completely from the ground. It is essential that the trees be covered with the spray, from the trunks to the tips of the twigs. On an average, 34 gallons per tree are required for good-sized trees, and by having experienced workmen and using large quantities the average cost per large tree amounts to 2*s*. An average of 85 large trees per day was sprayed by one outfit with four men (seven men can handle two outfits). The results obtained, while not accurately measurable the first year, seemed to do more than justify the cost in improved condition and increased growth of the trees and nuts.

VAILE (R. S.). **Notes on Walnut Aphis Control.**—*Mthly. Bull. State Commiss. Hortic., Sacramento, Cal.*, iii, no. 5, May 1914, pp. 221-223.

For several years past, *Chromaphis juglandicola*, the walnut aphis, has done considerable damage throughout southern California. Very early in the season this pest becomes numerous on the leaves and on the nuts as they are just setting. A large amount of honey-dew is secreted, following which the sooty fungus coats the leaves and fruit, choking, to a large extent, the respiration of the tree. The leaves often droop and fall to the ground before the crop is half matured. Control by the ladybird beetles, *Hippodamia convergens* and *Olla abdominalis* has proved unsatisfactory, and is hardly to be recommended as worthy of trial. Extensive spraying experiments against the walnut blight showed that, although there was comparatively little noticeable effect on the blight, there was a decided tendency to control the walnut aphis [see this *Review*, Ser. A, ii, pp. 581-582]. The eggs are usually laid singly in young buds, or in crevices on larger branches; they are occasionally found in groups of from three to seven. In 1912, careful inspection in the middle of February showed plenty of eggs, but no evidence of stem-mothers; the first stem-mothers were found on 5th March. In 1913, a very few stem-mothers were found as early as 15th February and no eggs were found later than 10th March. In 1914, the first stem-mothers were found on 6th March and eggs have been found as late as 16th March.

COAD (B. R.). **Feeding Habits of the Boll Weevil on Plants other than Cotton.**—*Jl. Agric. Research, Washington, D.C.*, ii, no. 3, June 1914, pp. 235-245.

Experiments were carried out by the author in connection with investigations on the biology of the boll weevil, *Anthonomus grandis*, at Victoria, Texas, on the possibility of the boll-weevil being able to breed in some of the native malvaceous plants. Various plants were tried and the average longevity of the weevils on each observed. On *Sphaeralcea lindheimeri*, the weevils fed readily, but deposited no eggs; the life of the weevil was short and it is unlikely that the insect would ever become adapted to feeding on this plant. Weevils fed on *Callirrhoe involucrata* and *C. pedata* and lived a comparatively long time, but their chance of breeding was slight and only observed in rare instances. From experiments made with *A. grandis* and *A. grandis* var.

*thurberiae* on *Hibiscus syriacus* it was found that it was quite possible for the insect to breed in the buds, and it seems probable that this would not be unusual. Louisiana and Texas boll-weevils and the Arizona Thurberia weevil were all tested, the conduct of the three types in relation to feeding being practically the same ; all showed the same preference for feeding first on the corolla and the stamens of the flower, followed by the buds and then the fruit. The longevity of weevils fed on *Hibiscus* was little short of that of those fed on cotton. No weevils have been found breeding on plants other than cotton and *Thurberia* under field conditions, except a single individual on *Hibiscus syriacus* at Victoria, Texas, in June 1913.

Burkill (I. H.). **The Sirangoon Outbreak (1913) of** *Brachartona catoxantha*.—*Gardens' Bull., Singapore,* i, no. 7, 20th June 1914, pp. 207-208.

A severe outbreak of the coconut pest, *Brachartona catoxantha,* has occurred in the coconut plantations about the head of the Sirangoon river, near Singapore. These caterpillars also attacked the leaves of a species of *Calamis* and the *Areca* palm in the affected area. The degree of parasitism of the pupae due to a Tachinid and a Braconid was only 4 per cent. A circular was distributed among the plantation owners asking them to burn the lower leaves of the palms on which the caterpillars had pupated in large numbers. By this means and by spraying, the moths were kept more or less in check, but it was evident that they were spreading into previously unaffected areas. At this stage, a fungus, new to science, was found attacking the moth and with its aid the outbreak was stamped out. This fungus, which has been named *Botrytis necans,* was distributed artificially by taking strips of coconut leaves with dead caterpillars or pupae on them and tying them to the leaves of trees where healthy caterpillars were feeding; the caterpillar pupates in a silken hammock under the leaf which it has been eating, and if infected by the fungus, generally dies inside the hammock, the spores coming to the outside in the form of dust ; the fungus is therefore easily found, and there was no difficulty in collecting the supplies required ; the distribution of the fungus was probably greatly assisted by the wind.

Kasargode (R. S.). **A Preliminary Account of the Coccidae of Western India.**—*Jl. Bombay Nat. Hist. Soc.,* xxiii, no. 1, 30th June 1914, pp. 133-137.

A systematic account is given of the Coccidae of Western India, which are not well known. Although Coccids are not so obvious in Western India as in some other parts, they occur abundantly on many fruit trees ; the mango tree alone is attacked by many species, always associated with the Loranthus (mistletoe) parasite ; they are also common on the fruit of the betelnut palm and on various citrus fruits. Fruit culture is now increasing and the importance of these pests will be more fully realised than has been the case hitherto. Fifteen species of *Diaspinae,* six of *Lecaniinae,* four of *Dactylopiinae,* one of *Asterolecaniinae,* and two of *Monophlebinae* are recorded.

**Report of Horticultural Inspector, Chief Inspector of Fruit, etc.**—*Rept. S. Australia Dept. Agric., 1912-13, Adelaide*, 1914, pp. 42-52. [Received 4th August, 1914.]

This report includes those of the Fruit and Orchard Inspectors of the various districts in the State. The Government fumigation plant now operates against citrus red scale, *Chrysomphalus* (*Aspidiotus*) *aurantii*, at the owner's cost, upon neglect of the inspector's notice to disinfect. Besides citrus trees in South Australia the red scale has been found on holly (*Ilex*), *Euonymus*, sweet bay (*Laurus nobilis*), *Coprosma lucida*, roses, carob (*Ceratonia siliqua*), grapevines (*Vitis vinifera*), and common fennel (*Foeniculum vulgare*). None of these plants, with the exception of *Ilex* and *Euonymus*, are, however, believed to be permanent hosts, as in all cases where the scale has been found on them, citrus trees were growing or had recently existed. Vine-growers successfully protested against the landing at Port Adelaide of several shipments of potatoes and onions grown in Italian vineyards, owing to the danger of conveying *Phylloxera*. Consignments of Fiji bananas were fumigated owing to their being infested with what was believed to be a species of *Aspidiotus*; fruit-fly larvae were not so numerous as usual on bananas from Queensland.

No traces of red scale, *C. aurantii* (*Aspidiotus coccineus*), have yet been found in the south-eastern district, where the more common pests of the year were *Cydia* (*Carpocapsa*) *pomonella*, *Schizoneura lanigera*,) *Tetranychus telarius*, *Otiorrhynchus cribricollis*, *Lepidosaphes ulmi* (*Mytilaspis pomorum*), *Phthorimaea operculella* (*Lita solanella*) and *Heterodera radicicola*, the last two attacking potatoes. Additional pests found in the southern district included aphis, red spider (*Bryobia*), harlequin bugs, coon bugs, and *Aspidiotus ostreaeformis*. In the north-eastern district, root-borers, *Otiorrhynchus* and red spider (*Bryobia*) were all in evidence. The *Otiorrhynchus* weevils were trapped in a trough placed on the ground round the stem of the tree and filled with oil, while red oil or crude oil emulsion applied in winter was effective against *Bryobia*. A house to house visitation in the Adelaide Plains district showed *Chrysomphalus aurantii* to have taken a very great hold on the citrus trees, as well as on other shrubs, and fumigation appears to be the only reliable remedy against it; arsenate of lead was found to be fairly successful against codling moth and *Otiorrhynchus*. In the northern district the pear and cherry slug (*Selandria cerasi*) [probably *Eriocampoides limacina*, Retz.] was the only new pest, and a prompt and thorough application of arsenate of lead controlled it. Woolly aphis and red spider were controlled by red oils in winter, but injections of carbon bisulphide into the soil were not satisfactory against the apple root-borer, a weevil nearly allied to *Leptops hopei*, for the control of which arsenical sprays and hand-picking are now relied upon. The cottony-cushion scale (*Icerya purchasi*) was found on a few citrus trees.

Beal (F. E. L.) **The American Thrushes valuable Bird Neighbours.**—*Yearbook U.S. Dept. Agric., 1913, Washington*, 1914, pp. 135–142, 1 plate.

A study of the diet of birds of the thrush family justifies the protection of them, and shows that they are useful to farmers in checking

the ravages of harmful insects. Although they eat fruit and berries they prefer animal food, particularly insects, including the following important pests :—Grasshoppers, ants, potato beetle (*Leptinotarsa decemlineata*), plum curculio (*Conotrachelus nenuphar*), clover-leaf weevil, may beetle (*Lachnosterna* sp.), corn weevil (*Calandra* sp.), alfalfa weevil, army worm, cutworms, codling moth (*Cydia pomonella*), cabbage worm, chinch bug (*Blissus leucoptera*), black olive scale (*Saissetia oleae*), etc. If they become too numerous they are obliged to seek for food in the orchards and are destructive to fruit, but in this case they are best kept off with scarecrows and should not be killed.

Campbell (R. E.). **A new Coccid infesting Citrus Trees in California.** —*Entom. News, Philadelphia*, xxv, no. 5, May 1914, pp. 222-224.

This new species, which the author proposes to call *Coccus citricola*, was first identified as *C. longulus*, Doug., and later as *C. elongatus*, Sign. It occurs in various parts of California, where it is probable that in the past it has been confused with *C. hesperidum*, L. *C. citricola* has hitherto been only found on the leaves and twigs of citrus trees. The young scales settle mostly on the leaves and when about half-grown migrate to the small twigs. No scales have been found on twigs larger than one-half inch in diameter, and the infestations are largely confined to the lower half of the tree. They are usually abundant, and are arranged on the twigs in a curiously imbricated and quite characteristic manner.

Drago (A.). **Provvedimenti contro la bianca-rossa.** [Measures against *Chrysomphalus dictyospermi*.]—*Giorn. Agric. Merid., Messina*, vii, no. 5, May 1914, pp. 77-81.

The author refers to the law of the 26th June 1913, dealing with plant pest control, one of the clauses of which provides that a state subsidy of up to 50 per cent. of the cost may be granted in cases where universal control is required. Another clause gives the authorities power to compel agriculturists to form an association where the lack of such an association involves danger to agricultural interests.

F. P. **Contro il lecanio dell'olivo e degli agrumi.** [Against the olive and citrus scale, *Saissetia oleae*, Bern.]—*Giorn. Agric. Merid., Messina*, vii, no. 5, May 1914, pp. 89-90.

Besides causing direct injury, *Saissetia* (*Lecanium*) *oleae* favours the sooty fungus, and is thus doubly harmful. To ascertain the correct date for beginning control, Martelli advises that small pieces of twigs be cut from badly infested trees and placed under a glass tumbler on a sheet of white paper. The contents are carefully watched daily, and when a number of small reddish insects are observed at the top or on the side nearest the light, spraying should begin with the same lime-sulphur as that used against *Chrysomphalus dictyospermi*.

Zschokke (A.). **Die Bekämpfung des Heu- und Sauerwurmes mit Nikotinseifenbrühen.** [Control of the vine moth with nicotin-soap mixture.]—*Weinbau der Rheinpfalz, Neustadt a. Hdt.*, ii, no. 9, 1st May 1914, pp. 95-100.

Nicotin was introduced as a control into the Palatinate 10 years after the present vine moth period began. The French "nicotine titrée" was originally used—six years ago—but the quantity available proved insufficient; American tobacco was imported and found superior to French, Alsatian, or crude nicotin. Loss of bloom and retardation of ripening are among the disadvantages of nicotin-soap. The latter defect is due to the soap, and this ingredient has been gradually reduced to one-sixth of the amount employed in 1910 and the quality selected is as neutral as possible. In consequence it is hoped that ripening will be normal in 1914. The vine-growers' association is compounding the concentrated nicotin-soap mixture to be used in 1914. Twenty gallons of diluted spray will contain 4½ oz. of 10 per cent. nicotin (produced by the Austrian Régie) and 16 oz. of soap, and the requisite quantity of concentrated mixture to produce this will cost about 2*s.* 6*d.*, tins included. Over 6,000 gals. of mixture have been prepared, the members of the association alone taking over 4,600 gals. Growers must carefully watch for the appearance of the moths in their particular locality, as the correct date for spraying is of the highest importance. The best results can only be obtained if both generations are sprayed for. Many attempts have been made to combine treatment against *Peronospora* with that against the vine moth, and they have usually failed because the soap combines with the excess of lime in the Bordeaux mixture. The author thinks that if the above nicotin-soap mixture be made up with a weak Bordeaux mixture the result will be satisfactory, as both soap and lime will only be present in small quantities. There is no reason to fear any bad flavour in the wine made from nicotin-sprayed grapes. This defect was due to the large quantity of soap formerly used and should no longer be possible. The author considers nicotin-soap to be the best of the chemical controls against the vine moth, but growers must remember that winter-control against the pupae is still the most important measure of all.

P. F. **Zur Reblausbekämpfung.** [Phylloxera control.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 9, 1st May 1914, pp. 132-134.

Figures are given regarding the spread of Phylloxera in the neighbourhood of Metz. From 1876 to 1904—a period of 28 years—about 322 acres (including the safety belts) were destroyed. In 1904, control was abandoned, and in the nine years up to 1913 about 315 acres were destroyed, while the vines in about 352 acres are seriously affected. Luxemburg vine-growers must continue to practice control if similar disastrous results are to be avoided. In 1907, the infested stocks in the Grand Duchy were 3,245, and in the six years up to 1913 this number has only increased to 5,596, so that control is thought to be justified. Although the author recognises the value of American stocks, he points out that their introduction involves difficulties greater than those which occur at present.

**Martin** (J. B.) **Utilité du papillonnage contre la Cochylis et l'Eudémis. Une chasse intéressante.** [The utility of moth destruction in the control of *Clysia* and *Polychrosis*.]—*Rev. Vitic., Paris,* xli, no. 1064, 7th May 1914, pp. 505-508.

During 1910 and 1913 the Touraine vine-growers suffered a loss of about £2,000,000 through *Clysia* and *Polychrosis*. The outbreak in September 1913 was so severe and unexpected that only a few vine-growers succeeded in saving their vintage, among them M. Léger, in Chinonais, who adopted the following measures:—On the first moths appearing in May, steps were taken to capture them. Two rows of vines were dealt with by three men, one placed between the rows and the other two on either side of them. The most suitable times are from about 6 p.m. to nightfall and at daybreak, just after the dew has fallen. The vines are lightly shaken and the moths watched as they fly away, and the spot where they alight being noted, they are easily crushed between the hands as they rise again. In one vineyard of about 2½ acres about 100 were killed in the middle of May and 517 in another of about 6¼ acres. The larvae were also collected by hand during the second half of June, about 11,000 being thus destroyed. A few moths of the second generation appeared on the 3rd July, but only became numerous on the 16th, when work was started. In the smaller vineyard 311 moths of the second generation were killed and 1,976 in the larger. On the 8th of August injury to the grapes was noticed and injured fruit were picked on the 20th. Calculations show that about 416,000 larvae were destroyed in this way in the red vines. In the case of white vines the injured grapes are picked at vintage time, a quantity equivalent to 3½ casks of wine being removed on the 23rd September. The above work shows that less eggs are laid by the first than by the second generation. The ratio between the moths of the first and second generation in the two vineyards being as 1 : 3·11 and 1 : 3·8 respectively. The bunches of grapes were also dusted with lime and sulphur. Arsenicals had not, however, been used against the first generation, as the outbreak was unexpected. M. Léger considers that control of all stages of *Clysia* is absolutely necessary. It cost him about £7 in extra labour and the loss of five casks of wine, but he saved two-thirds of his vintage, amounting to about 100 casks of wine. Those of his neighbours who had neglected control lost practically everything.

**Mallet** (R.). **Les Bouillies cupriques.** [Copper sprays.]—*Rev. Vitic., Paris,* xli, no. 1064, 7th May 1914, pp. 520-522.

The following data are given in an article on copper sprays for combating the black-rot disease. Copper sulphate, which is usually employed in making up the solutions, should be 98–99 per cent. pure, equivalent to 25 per cent. of pure copper. When buying a commercial solution of which the copper percentage is given, it will be sufficient to multiply that figure by 4 in order to obtain the percentage of copper sulphate. The latter chemical is often adulterated with iron sulphate, the presence of which may be readily detected by adding some ammonia, iron oxide being formed. Copper acetates (verdigris) contain 31–34 per cent. of pure copper and are also used in compounding sprays. The spray solutions are neutralised—and rendered

adhesive to some extent—by an addition of "fat" lime or sodium carbonate. The latter must be 90 per cent. pure. An excess of these substances produces an alkaline spray solution. In practice, copper sulphate is neutralised by one-quarter of its weight of quicklime or one-half of sodium carbonate, but these proportions vary somewhat. Additional adhesive qualities are obtained by using gelatin, casein, molasses, linseed oil, soap, resin, petroleum and sapindus.

GAY (A.). **L'Altise (Pucerotte, puce de la vigne, bleuette).** [The vine flea-beetle, *Haltica ampelophaga*.]—*Rev. Vitic., Paris*, xli, no. 1064, 7th May 1914, pp. 522-523.

The control of *Haltica* is furthered if the hibernating adults are dealt with by clearing the vineyard of all natural refuges and replacing them by shelter traps during the month of August. Control is easily effected if measures be universally taken on the first appearance of the insects.

DALMASSO (G.). **Nuovi e più vasti orrizzonti della patologia vegetale.** [New and vaster boundaries of plant pathology.]—*Riv. Vitic., Enol. Agrar., Conegliano*, xx, no. 10, 15th May 1914, pp. 228-231.

Besides utilising entomophagous insects in the control of phytophagous insect-pests, the latter themselves may occasionally be employed for this purpose. The following case has been instanced by Vuillet [see this *Review*, Ser. A, ii, p. 345.] :—*Aphis sorghi*, Theo., which sometimes causes much damage to crops in West Africa, is combated by predatory Coccinellids, which also attack another Aphid, *Siphonophora leptadeniae*, Vuill., found on *Leptadenia lancifera*, a wild plant growing near the sorghum fields. This species is not injurious to sorghum or other cultivated plants, and the increase of *Siphonophora* will naturally benefit the Coccinellid enemies of *A. sorghi*. One of the principal controls against the latter is the destruction of the sorghum stubble left after harvesting, a measure which, unfortunately, destroys the parasites. This disadvantage may be avoided by planting some *Leptadenia* infested by *Siphonophora* near the fields as an attraction for the Coccinellids [see this *Review*, Ser. A, ii, p. 396.] Matters are more complicated in the case of the vine moth, *Polychrosis botrana*. One of its enemies is a small Hymenopteron, *Trichogramma* (*Oophthora*) *semblidis*, Aur., which parasitises its eggs and also those of *Barathra* (*Mamestra*) *brassicae*, L., so common on cabbages. Unfortunately, cabbages also harbour *Pieris brassicae* and *Pieris* occasionally favours the development of the vine moth. *P. brassicae* is parasitised by *Apanteles glomeratus* and *Anilasta ebenina* and these, in turn, are parasitised by *Dibrachys affinis*. *Dibrachys* plays a double role in relation to *Polychrosis botrana*. As a primary parasite of *Polychrosis* it is beneficial, but it is also a parasite of such enemies of the vine moth as *Phytomyptera nitidiventris*, and is, therefore, injurious. For this reason it is not always advisable to plant cabbages among the vines. Vuillet has shown that calculation furnishes the key to a complex problem such as is presented by these insects. It is first necessary to determine the

highest percentage of parasitisation for each species concerned, which is a host, the observation being made on 100 individuals derived from the same batch of eggs. Once this difficult determination has been made, a simple calculation shows which insects should be encouraged for control purposes.

FEYTAUD (J.). **La mortalité des chrysalides de Cochylis et d'Eudémis pendant l'hiver.** [Winter mortality among *Clysia* and *Polychrosis* pupae.]—*Rev. Vitic.*, xli, no. 1066, 21st May 1914, pp. 573-575.

The author briefly discusses the natural enemies of *Clysia* and *Polychrosis* and tabulates the results of a laboratory investigation of the mortality among the latter. Batches of 100 to 300 pupae were collected at five different localities and the following figures give the proportions per 100 of dead *Polychrosis*, viz. :—87·1—90·1—75·0—93·2—85·7. The causes of death were :—Fungi, 57·9—59·8—48·2—47·5—50·0 ; Ichneumons, 21·8—19·0—13·1—16·9—29·5 ; predatory enemies, 1·3—8·1—5·0—20·3—2·7 ; various enemies, 6·1—3·2—8·7—8·5—3·5. This shows the mortality to have been severe during the winter of 1913–1914, more so than in the last few years. Fungi were the most active agents owing to the continued heavy rains in autumn. The frosts do not appear to have injured the hibernating pupae [see this *Review*, Ser. A, ii, p. 301], but their enemies which are active in winter have suffered from them. For instance, the larvae of *Malachius*, abundant during the preceding winter and at the beginning of that of 1913–1914, were rare in March 1914. In spite of the heavy mortality shown above, preparations must be made for control, as only a few moths of the first generation are required to produce numerous larvae in June and August.

SCHAEFER (A.). **Ueber Pflanzenschutzmittel.** [Materials for plant protection.]—*Der Obstzüchter*, no. 6, 1914. Reprint, 3 pp. [Received 24th June 1914.]

The author disputes the efficiency of the so-called universal controls against fungoid diseases and insect pests. Remedies advertised for use against individual pests should only be used if tested and approved by a competent authority. A case is referred to where a product, having been tested and found useless, was then advertised by the maker as "officially tested." A third class comprises such products as "carbolineum" and "bird-lime." These names are often a cloak for quite useless substances. A brand of bird-lime which had given good results up to a certain time, eventually proved quite unattractive though still retaining its adhesive character. As regards carbolineum, it would appear that any waste product of the tar industries is liable to be sold under this name. A further class includes remedies of which the active components are either stated by the maker or are implied by the name, such as lime-sulphur mixture. When purchasing these it is necessary to ascertain whether the maker guarantees a certain percentage of the active ingredients, and an independent test is also advisable, as a substance indicated in the name may sometimes be entirely absent. Last of all come those preparations which have

been on the market for several years and are being constantly tested by competent authorities. These may be expected to give results indicated in the carefully worded official certificates, but not necessarily those claimed in the advertisements.

WAHL (B.). **Die Fritfliege.** [The frit fly.)—*Mitteilung der k.k. Pflanzenschutzstation in Wien*, n.d., 3 pp. [Received 24th June 1914.]

*Oscinis frit*, L., usually occurs in meadow grass and only migrates to wheat when its numbers increase considerably. Control measures should endeavour to prevent the spring and autumn generations from finding young wheat on which to oviposit. The injury caused by *Oscinis frit* closely resembles that produced by *Hylemyia coarctata*, L., and microscopic examination of the larvae is necessary to determine the identity of the pest concerned. As *Hylemyia* also occurs in Austria and requires a control totally different from that applicable to *Oscinis*, such a determination is indispensable.

FULMEK (L.). **Die gelbe Stachelbeer–Blattwespe.** [The yellow gooseberry saw-fly.]—*Der Obstzüchter*, no. 6, 1914. Reprint, 4 pp., 2 figs. [Received 24th June 1914.]

The serious injury caused by the larvae of the yellow gooseberry saw-fly (*Pteronus ribesii*) renders it very necessary that the first signs of attack be noted and instantly acted on. The eggs are laid in April on the underside of the leaves and in a few days the green, dark-headed larvae hatch and eat the foliage. At the end of three or four weeks they enter the soil and spin a cocoon. The second generation appears in June and July and the resultant larvae do less, though by no means unimportant, damage, and may also attack currants. A third generation sometimes occurs in the late summer. The last larvae hibernate at some depth in the soil and give rise to the adults which appear in spring. Wood-ashes are an efficient control if strewn over the bushes while they are still damp with dew, provided this be done when the attack commences. Lime-copper spray also deters the larvae from feeding. Tests made with barium chloride have been very satisfactory; a two per cent. aqueous solution of this was successful in preventing injury. The bushes were sprayed once, either late in April or early in May. The foliage must be thoroughly wetted and the jet directed into the interior of thick bushes. Commercial barium chloride costs about 2½*d.* per lb., dissolves in cold water, and does not deteriorate in solution. It is poisonous, and should be carefully stored, as it strongly resembles ordinary salt in appearance. Spraying immediately before the fruits ripen is inadvisable, though any traces of the poison are easily washed off. To prevent a recurrence of the pest, 3 or 4 inches of the soil may be dug up and burned after the larvae have begun to hibernate. Quicklime may also be dug in in autumn, and if poultry be allowed to run among the bushes many larvae will be destroyed.

GOWDEY (C. C.). **Annual Report of the Entomologist.**—*Ann. Rept. Uganda Dept. Agric. for the year ended 31st March 1914, Kampala,* 1914, pp. 36-58. [Received 12th Sept. 1914.]

During 1913, *Stephanoderes coffeae*, Haged., was extremely numerous, and was found to attack stored coffee berries as well as those on the trees; the author reproduces his article on *Dirphya princeps*, Jord., [see this *Review*, Ser. A, ii, pp. 275–276.] The Bostrychid coffee borers, *Apate indistincta*, Murr., and *A. monacha*, F., differ from *D. princeps* in that they always burrow upwards, and more than one insect may be found in one burrow; the frass near the base of the trees indicates the presence of these borers, against which carbon bisulphide or carbon tetrachloride are of little use, though benzene has given good results. Two or three pieces of cotton wool soaked in benzene should be introduced loosely into the tunnel, after the frass has been removed from the orifice, which should then be sealed with plaster of Paris. The larvae of *Parasa* sp. and *Metadrepana glauca*, Hmp., feed on coffee leaves, and the best insecticide against these caterpillars is chromate of lead (3 lb. in 100 gallons of water). Crickets (*Gryllotalpa africana*, P. de B., and *Gryllus bimaculatus*, de G.) confine their attacks to the nurseries and young plants [see this *Review*, Ser. A, ii, p. 59.] Besides three undetermined species, the COCCIDAE at present known to attack coffee in Uganda are:—*Pseudococcus* (*Dactylopius*) *citri*, Risso, *Pulvinaria psidii*, Mask., *Ceroplastes ceriferus*, And., *C. galeatus*, Newst., *C. vinsonioides*, Newst., *Lecanium africanum*, Newst., *Coccus* (*L.*) *viridis*, Green, *Stictococcus gowdeyi*, Newst., and *Selanaspidus articulatus*, Morg. *L. africanum* probably is the only one of which coffee is the sole food-plant. Experiments in the use of kerosene oil as a bait for the Mediterranean fruit-fly (*Ceratitis capitata*, Wied.) and also the cacao fruit-fly (*C. punctata*) were not successful, the oil evaporating too soon and the proportion of females to males attracted being very small; the fly was as prevalent as during the previous year. Cutworms were also troublesome, but they are usually to be found about four inches from the stem and not deeper than three, and a systematic search for them is preferable to the use of poisoned baits.

Cotton was attacked by the spiny bollworm, *Earias insulana*, Boisd., which lays its eggs preferably on the bolls and particularly in the grooves near the apex. These are laid singly after dusk, and a moth kept under observation in the field laid 210 eggs in five consecutive nights, decreasing from 87 on the first to 7 on the fifth night, but it is probable that the egg-laying period may extend over a much longer time. The young larvae bore into the bolls near the base, and their presence may be detected by the excrement exuding from the hole they make; they sometimes also bore into terminal buds. The moths are nocturnal in habit, hiding during the day between the involucre and the boll. Four experiments show the length of the incubation period to be from 4 to 6 days, of the larval from 14 to 15 days, and of the pupal stage from 10 to 14 days; there are several generations during a season. The loss caused by this bollworm is accentuated by bacterial action, induced by the presence of excrement, which sets up in the boll, and by the larval-borings which allow of the entrance of the spores of saprophytic fungi. The Malvaceae are the only known food-plants of *E. insulana*, and as traps, rows of *Hibiscus esculentus* should

be grown at intervals throughout the field, and destroyed when containing larvae. All infested parts of the plant should be destroyed as well as uncultivated malvaceous plants, for which a search should be made in the vicinity of the cotton field. Three NITIDULIDAE, *Carpophilus mutillatus*, Erich., *C. binotatus*, Murr., and *C. luridus*, Murr., feed upon the decaying tissues in the bores of the bollworms. The four cotton stainers recorded are *Dysdercus nigrofasciatus*, Stål, *D. pretiosus*, Dist., *Oxycarenus hyalinipennis*, Costa, and *O. gossypinus*, Dist. The leaf-footed plant bug, *Leptoglossus membranaceus*, F., attacks the seed of cotton, but clean cultivation and the destruction of the uncultivated food-plants (three species of Cucurbitaceae) in the vicinity of the cotton plots should prevent damage. Of the six COCCINELLIDAE found preying on *Aphis gossypii*, Glov., the following are recorded :—*Chilomenes lunata*, F., *Solanophila bosci*, Ws., *Epilachna chrysomelina*, F, var., *Chilocorus angolensis*, Cr. A small swarm of *Zonocerus variegatus*, L., on cotton was easily checked by using Paris green applied in a powder.

Few reports were received of damage by the cacao beetle (*Adoretus hirtellus*, Castn.), while the whale-oil soap treatment controlled *Toxoptera theobromae*, Schout. *Stictococcus dimorphus*, Newst., and *Pseudococcus* (*Dactylopius*) sp. are the only two Coccids known to attack cacao in Uganda. *Gryllus gracilipes*, Sauss., is very similar in its habits to *G. bimaculatus*, already referred to as attacking coffee, and these two species as well as *Gryllotalpa africana* are recorded as attacking cacao. A millipede of the genus *Odontopyge* attacked freshly planted cacao beans and very young seedlings; the beans should be soaked in a solution of corrosive sublimate (1 : 1,000) for one hour as a preventive.

Among rubber pests the larvae of *Glyphodes ocellata*, Hmp., eat tips and margins of the leaves of *Funtumia elastica* and *F. latifolia* and pupate within the rolled leaf margins. *Pulvinaria psidii*, Mask., attacks *F. elastica*, and *Chionaspis funtumiae*, Newst., *F. latifolia*, while two other undetermined scale-insects attack Ceara and Para rubber. *Xyleborus confusus*, Erich., *X. affinis*, Erich., and *X. camerunus*, Haged., attack Para rubber trees at the tapping cicatrices, but may be kept away by painting the trunk with coal tar.

A list is given of the insects which were of economic importance during the year, together with the plants attacked.

The amount of *Anaphe* silk exported during 1913–14 was about 12 tons, but this figure is not indicative of the growth of the industry.

LELLI (A.). **La malattia del gelso e il suo rimedio** (*Diaspis* e *Prospaltella*). [The disease of the mulberry tree and its remedy.]—*Consigliere dell'Agricoltore, Turin*, ii, no. 5, May 1914, pp. 151-157, 7 figs.

This is a popular account of the infestation of mulberries by *Aulacaspis* (*Diaspis*) *pentagona* and its control by *Prospaltella berlesei* [see this *Review*, Ser. A, ii, pp. 441 and 526].

Miatello (H.). **La Esparraguera, su cultivo y explotacion.** [The cultivation and working of asparagus.]—*Bol. Minist. Agric., Buenos Aires*, xvii, no. 5, May 1914, pp. 530-620, 81 figs., 1 pl.

This paper describes the cultivation of asparagus in the Argentine Republic and contains a bibliography of 25 works. An account is given of the principal European insect enemies :—the asparagus beetle, *Crioceris asparagi*; the asparagus fly, *Platyparea poeciloptera* [see this *Review*, Ser. A, ii, p. 403]; the mole-cricket, *Gryllotalpa vulgaris*; and the white grub, *Melolontha melolontha.*

**Como combatir la hormiga colorada.** [How to combat the red ant.]—*Gaceta Rural, Buenos Aires*, vii, no. 82, May 1914, p. 861.

One method of combating red ants consists in pouring a couple of spoonfuls of carbon bisulphide down the holes in their nests into which a lighted match is thrown from a distance. Immediately after the explosion all holes from which smoke issues are sealed. As an alternative, cyanide of potassium may be placed in the holes or in paths in dry weather.

Crosby (C. R.) & Leonard (M. D.). **An Egg-parasite of the Tarnished Plant-Bug,** *Lygus pratensis*, **L.**—*Canadian Entomologist, London, Ont.*, xlvi, no. 5, May 1914, pp. 181-182.

The authors describe a Hymenopterous parasite, *Anagrus ovijentatus*, sp. n., which they have reared from eggs of the tarnished plant-bug, *Lygus pratensis*, found on the flower-heads of the daisy flea-bane (*Erigeron ramosus*).

**Termites in Vineyards near Bordeaux.**—*Bull. Soc. Nat. Acclimat., Paris*, lxi, no. 9, 1st May 1914, pp. 301-304.

Termites are reported from some localities near Bordeaux, and though no serious injury to the vines is probable from the species concerned, yet precautionary measures are advised. Regarding natural control, M. Rivière expressed the view that perhaps too much is expected from entomophagous insects in the fight against pests, and cited many failures in this direction—especially the hoped-for destruction of *Haltica* by *Perilitus brevicollis.*

**La nicotina en agricultura.** [Nicotin in agriculture.]—*Rev. Inst. Agric. Catalán S. Isidro, Barcelona*, lxiii, no. 9, 5th May 1914, pp. 132-135.

This article is a popular account of the nature, composition and properties of nicotin and gives the formulae for the sprays required for various pests together with the appropriate modes of application.

**Mesures concernant l'entrée des végétaux en Algérie.** [Measures relating to the importation of plants into Algeria.]—*Moniteur d'Hortic., Paris*, xxxviii, no. 9, 10th May 1914, pp. 97-98.

A decree signed by the President of the French Republic on the 18th April 1914, forbids the general importation into Algeria of plants in a ligneous state (other than the vine and resinous species), palms (rooted or not rooted) and their fresh débris. This applies to shipments coming from foreign countries or from the French departments of Alps-Maritimes, Var, Bouches-du-Rhône, Gard, Hérault, Aude, Pyrénées-Orientales and Corsica. Such shipments must be entered at certain points to be subsequently specified by the Governor-General of Algeria. On arrival disinfection is obligatory, except where a satisfactory certificate from the French Ministry of Agriculture accompanies the goods and the latter are seen to be non-infested. Plants in a ligneous or herbaceous state will be admitted with the surrounding soil if they have been grown in pots in French establishments on the lists drawn up by the Ministry of Agriculture in accordance with Article 9, paragraph 6, of the International Convention of Berne. In the case of foreign plants, a special consular certificate must be obtained from the French Consul and exchanged for a permit from the Governor-General of Algeria before the goods leave the exporting country.

NOEL (P.). **Les ennemis des jacinthes.** [Hyacinth pests.]—*Moniteur d'Hortic., Paris,* xxxviii, no. 9, 10th May 1914, p. 104.

The known pests of hyacinths are stated to include the Acarid, *Cepophagus echinopus* and the Nematodes *Tylenchus devastatrix*, Kuhn, and *Tylenchus hyacinthi*, besides fungoid and bacterial diseases.

MANCHERON (P.). **La lutte contre les Criquets dans la Commune Mixte du Djebel Nador.** [Locust control in the Mixed Commune of Djebel Nador.]—*Rev. Agric. Vitic. Afr. Nord, Algiers,* iii, no. 114, 16th May 1914, pp. 460-461.

The following information regarding locust control in Djebel Nador, has been supplied by M. Maurice Blanc. For about three weeks locusts have been hatching out along a front of some 60 miles, from 7,000 to 10,000 acres being infested. A defence syndicate has been formed, including both European and Native agriculturists. The former pay a contribution of 1*d.* per acre sown and the latter one of 20*d.* per plough, a government subsidy being added. About 100 defence stations have been organised, the labour being mainly native. The following procedure is adopted : Zinc plates are used to surround the locusts and stop their advance and lead them to trenches where cresyl is poured on them. Long pieces of cloth are spread out on the ground on to which the locusts are driven. When a sufficient number have accumulated, the cloth is folded and the locusts are poured into sacks and crushed. So far, over 80 tons have been secured in this way, which the syndicate has paid for at the rate of about £4 per ton. Another method consists of making a semi-circle of alfa grass into which the locusts are driven, the grass being then set on fire. As the Arabs understand the danger which menaces their crops, it is hoped to effect control to a considerable degree.

Jametel (V.). **Moyens de destruction des Courtilières ou Taupes-Grillons.** [The destruction of mole-crickets.]—*Moniteur d'Hortic. Paris,* xxxviii, no. 10, 25th May 1914, pp. 119-120.

To protect garden beds from mole-crickets, they may be enclosed with 4-inch boards, half-buried, with gaps at intervals, in which pots, 6 to 8 inches in diameter, are sunk level with the soil. These may be empty or filled with water or flour. To keep these pests away from pot beds, clinkers should be spread round or beneath them. The presence of a nest is usually indicated by a small mound of worked earth, beneath which it will be found at a depth of about 6 inches. The galleries may be flooded, or soapy water, petroleum, carbon bisulphide, etc., poured into them. Before making sowings in infested beds, they may be covered with cooked grains of maize, sprinkled with arsenious acid and raked over with earth. Napthalene crystals drive away mole-crickets, but do not kill them. The author also mentions traps [see this *Review*, Ser. A, i, p. 496] and insists that no method is really efficient unless continuously persevered in, when success should be attained in two or three years.

Mancheron (P.). **Un Nouveau Traitemènt du Phylloxera.** [A new *Phylloxera* cure.]—*Rev. Agric. Vitic. Afr. Nord, Algiers,* xii, no. 116, 30th May 1914, pp. 511-512.

The author is informed that absolutely conclusive tests against *Phylloxera* have been made with a special product, a sample of which has been given to him by the inventor. The procedure is exceedingly simple. A hollow is made round the stock and the substance placed therein. As much water as possible is poured in so as to soak the soil around the roots with the active principles contained in the remedy. It is said that dying vines which were thus treated recovered their vigour in two years, and that vines treated about eight years ago may be seen flourishing in the midst of re-planted vines. The cost is said to be about 5*d.* or 6*d.* per vine. The author is about to make some tests himself. The disadvantages of carbon bisulphide do not occur with this remedy, which appears to confer a lasting immunity from infestation.

Bauer (E.). **Vogelschutz, Obstbau und Gespinstmotte.** [Bird protection, fruit-growing, and *Hyponomeuta.*]—*Entom. Zeitschr., Frankfurt a. M.*, xxviii, no. 9, 30th May 1914, pp. 47–48.

The author states that hedges planted for bird protection will not prove a danger to fruit-growing even if composed of plants attractive to *Hyponomeuta.* The latter will always be sufficiently controlled by parasites and birds.

McIlwaine (R.). **Some Citrus Growing Experiences in Rhodesia.**—*Rhodesia Agric. Jl., Salisbury,* xi, no. 5, June 1914, pp. 703-709, 3 pls.

Citrus trees in Rhodesia are comparatively free from injurious insects and diseases, although in some districts the red scale is very destructive. Fumigation is effective, but complete eradication cannot

be hoped for; of recent years some parasite or fungus enemy of the red scale has established itself and keeps it in check. Young trees are frequently attacked by a soft brown scale, which is also to be found on many other indigenous plants, but yields readily to treatment by ordinary washes and sprays, though if neglected the resulting sooty deposit interferes with the natural functions of the foliage and retards the growth. The Australian bug [*Icerya purchasi*] makes its appearance at intervals, but is kept effectively in check by its natural enemies. The orange codling moth [*? Enarmonia batrachopa*, Meyr.] is more abundant than usual this year, and in some districts loss due to damage by the larvae amounts to 50 per cent.

**Citrus trees at Premier Estate.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 5, June 1914, pp. 766-767.

*Coccus hesperidum* and *Icerya purchasi* are recorded as being found on citrus trees everywhere in Rhodesia, The black aphis attacks the young growth of trees, and although it is persistent in returning it may be destroyed by the mildest form of wash.

GOUGH (L. H.). **Problèmes relatifs au nouveau fléau du cotton égyptien, le ver rose de la capsule ou *Gelechia gossypiella*, Saunders.** [Problems relating to the new pest of Egyptian cotton, the Pink Boll Worm, *Gelechia gossypiella*, Saunders.]—*Bull. Union Agriculteurs d'Eyypte, Cairo*, xii, no. 107, June 1914, pp. 196–197.

In this communication to the Congress of Tropical Agriculture, held in London, in June 1914, the author states that the number of generations of the pink boll-worm varies from one to six per annum in Egypt. *Pimpla roborator, Chelonella sulcata, Limnerium interruptum, Pediculoides ventricosus*, and *Microsporidium polyhedricum* are parasites capable of reducing the number of hibernating larvae by more than 40 per cent. In infested fields the attack was more severe in the second year and diminished considerably in the third. The only means of control at present available, are destruction during winter of all the cotton wood stored for fuel and fumigation or other treatment of the cotton seed.

VIVET (E.). **Les plaies de taille de la Vigne et les Termites.** [Termites and the cicatrices due to pruning the vine.]—*Bull. Agric. Algér. Tun. Maroc, Algiers*, xx, no. 11, June 1914, pp. 333-338.

The vine-growers in the Tipaza district were alarmed on finding most of the weak vine-stocks infested by termites when the first shoots were beginning to appear this year. The species concerned is *Calotermes flavicollis*, in the colonies of which Picard states that no workers or neuters occur, their rôle being taken by the larvae. It is these which vine-growers chiefly observe, there being but few soldiers in each colony. Attack is limited to those portions of the vine which are nearly dried up. This explains why the young and healthy vines are immune, while old ones, covered with cicatrices due to pruning and in which the sap-flow is weak, are specially attacked.

Such stocks are best destroyed, but if only slightly attacked, carbon bisulphide may be injected into the galleries, which should then be sealed. This will confer temporary, but not lasting protection. Preventive measures are best and a method of pruning which will reduce the surfaces cicatrised will reduce the amount of dead wood. After discussing the best methods of pruning the author expresses his belief that the only real protection against termites consists in maintaining the vines in a healthy condition. Cuts may be painted over with coal tar or other suitable substances.

RUTHERFORD (A.). **Insects Injurious to Camphor.**—*Trop. Agric., Peradeniya,* xliii, no. 6, June 1914, pp. 463-468.

In December 1913, the author observed that many buds and leaves of camphor bushes (*Cinnamomum camphora*) were blackened and dead, suggesting damage by a Heteropterous or Homopterous insect rather than by the thrips which the author found in the bud and inside cracks on the twigs, and which he believes to be *Cryptothrips floridensis*, described by Watson as injuring camphor in Florida [see this *Review*, Ser. A, i, p. 512]. The leaf-miner of camphor (*Acrocercops* sp.) which has also been reared from *Blumea balsamifera*, *Trewia nudiflora*, *Acyranthes aspera*, *Terminalia catappa* and *Bauhinia* sp., mines under the upper epidermis of the young leaves and causes a large blotch. Its parasites seem to keep this moth well under control, but in the case of a severe attack spraying with a tobacco decoction might be given a trial. The larvae are subject to the attacks of a small Chalcid, and a species of Braconid has also been reared from leaves infested by *Acrocercops*.

*Clania variegata*, Snell., has been recorded from tea and *Antigonum*, as well as from camphor, and the best way to deal with this bagworm is to collect and destroy the caterpillars. The cases of what is probably *Amatissa consorta*, and two species of what were believed to be Pyralid larvae, have been observed on camphor. Other insects attacking camphor are the beetles, *Xyleborus compactus*, Eichh., *X. arquatus*, Samps., *Xylopertha* sp., *Lepidiota pinguis*; the Lepidoptera, *Suana concolor*, *Papilio lankeswara*, *P. clytia* and *Attacus atlas*; two Acarids, *Tetranychus bioculatus* and *Brevipalpus obovatus*; a bug, *Coptosoma siamica*; a species of *Aspidiotus*, probably *A. rapax* (*camelliae*), and a twig-girdler, which often causes the young twigs to wilt and fall over.

COLLINGE (W. E.). **The Economic Importance of Woodlice.**—*Jl. Bd. Agric., London,* xxi, no. 3, June 1914, pp. 206-212, 1 plate.

The author says that such seasons as those of 1912 and 1913 have been very favourable to the rapid increase of woodlice, and consequently complaints of the damage they have done have been more numerous than for many years past. Of the thirty-five species found in the British Isles not more than nine or ten are sufficiently common to be of any economic importance.

*Trichoniscus roseus*, Koch, frequently does considerable damage in greenhouses and conservatories, attacking, amongst other plants, ferns

and orchids. *Oniscus asellus*, L., is a common pest in cold frames and potting sheds, and also in flower borders and vegetable gardens. *Porcellio scaber*, Latr., is frequently found in orchid houses and ferneries and has been recorded as damaging the bark of lime-trees. This species and *O. asellus* are the two commonest in this country. *P. scaber* is frequently found in cold frames in the Channel Islands often accompanied by smaller numbers of *P. dilatatus*, Brandt, and *P. pictus*, Brandt. *Porcellio laevis*, Latr., has been found attacking the roots of strawberry plants in the Channel Islands, while *Porcellionides pruinosus*, Brandt, has been taken on potatoes, and lettuce grown under glass. In flower borders an enormous amount of damage, often put down to slugs, is frequently caused by *Armadillidium vulgare*, L., the common pill woodlouse, which also attacks potatoes and field-beans, the latter plant being also attacked by *A. nasutum*, Budde-Lund.

Outhouses, potting sheds, etc., should be cleaned out from time to time, and rubbish heaps cleared away. Kerosene emulsion as a contact spray is effective, and sliced potatoes thinly covered with Paris green or London purple may be used as a bait for these pests. Sprinkling Paris green on the floor of a greenhouse and covering it with damp boards is very effective. Dusting the soil, especially along the sides of tiles surrounding flower beds, with equal parts of Paris green and ground unslaked lime is an excellent remedy. The loose straw and rubbish that collects round manure heaps should be raked together and burnt before the manure heap is opened for use. In this way many hundreds of woodlice may be collected and destroyed.

Maskew (F.). **Report of Investigation of the Fruit-fly Situation in the Territory of Hawaii.**—*Mthly. Bull. State Commiss. Hortic., Sacramento, Cal.*, iii, no. 6, June 1914, pp. 227-238.

This is a detailed account of a visit made by the author to Hawaii for the purpose of investigating the Mediterranean fruit-fly [*Ceratitis capitata*] in all its phases, with special reference to the value and results of the clean-culture campaign at Honolulu and its bearing upon preventing the introduction of the fruit-fly into California and the United States. The clean culture campaign, which the author very fully describes, had at the time of his visit been in operation for about thirty months, but in his opinion had not controlled the fly, nor has it reduced the amount of infested material reaching the mainland. The melon fly (*Dacus curcurbitae*) is also a source of great financial loss, and all its food-plants should be included in the list covered by the United States quarantine order. A Federal supervision of horticultural exports, similar to the system in force in the gipsy moth area, would protect the horticultural interests of the mainland much better than a continuance of the Honolulu campaign. Every article of commerce between the islands and the mainland constitutes a potential danger of introducing the fruit-fly, and shipments of bananas, under the present system of Federal inspection, do not constitute a greater danger than other articles. The question of mails, sealed baggage and passengers' clothing as avenues of entrance is one of grave importance, and measures aiming at the complete control of these should be devised.

**Insect Notes.**—*Mthly. Bull. State Commiss. Hortic., Sacramento, Cal.*, iii, no. 6, June 1914, p. 245.

L. Childs reports that the twig-borer, *Polycaon confertus*, Lec., was noticed in large numbers on the California buckeye, *Aesculus californicus*, prunes and pears, and that pupae and adults of the fruit tree leaf-roller, *Cacoecia* (*Archips*) *argyrospila*, and the cherry slug, *Eriocampoides* (*Caliroa*) *cerasi*, L., have been taken on cherry trees. *Icerya purchasi*, Mask., *Eulecanium cerasorum*, Ckll., and *E. pruinosum*, Coq., were observed side by side on the branches of the native California black walnut, the last being parasitised by *Comys fusca*, the common parasite of the apricot scale. Two Syrphid flies, *Lasiopticus* (*Catabomba*) *pyrastri* and *Syrphus americanus*, Wied., were found feeding in countless numbers on both the walnut aphis, *Chromaphis juglandicola*, Kalt., and the prune aphis, *Hyalopterus arundinis*, F.

E. J. Branigan records the larvae of the brown day moth, *Pseudohazis eglanterina*, on two species of willow, wild blackberry, wild grape, wild rose and prunes, and the oak moth, *Phryganidia californica*, on live and water oak. The western tussock moth, *Hemerocampa vetusta*, was collected on two species of oak, plum, cherry, hawthorn, apricot, apple, pear, prune and blackberry, and a Capsid bug, *Irbisia brachycerus*, Uhler, was observed feeding in large numbers in prune and olive orchards.

Kelly (E. O. G.). **Notes on the Biology of** *Diplazon laetatorius*, **F.**—*Jl. Econ. Entom., Concord*, vii, no. 3, June 1914, pp. 294-297.

The author records a case of one insect laying an egg on that of another insect, and of the subsequent development of the parasitic larva, not in the egg of the host, but in the larva of the latter. This insect was the Ichneumon, *Bassus laetatorius*, which was reared in several instances from the larvae of the Syrphid, *Baccha clavata*. Oviposition by *B. laetatorius* in the eggs of *B. clavata* was observed, and though the larvae of *B. clavata* hatched normally and grew to maturity, the adults of *B. laetatorius* issued from the pupae, having required about 35 days to reach the adult stage from the egg. The case is remarkable, since the egg of the Syrphid measures only about 1 mm., while the adult Ichneumon is about 8 mm. in length. Four families of parasitic Hymenoptera exhibit this method of parasitism, namely Ichneumonidae, represented by *Bassus laetatorius*, Proctotrupidae by *Polygnotus hiemalis* and *P. minutus*, Braconidae by *Chelonus texanus*, and Chalcididae by *Tetrastichus asparagi*, *Ageniaspis fuscicollis* and *Litomastix* (*Copidosoma*) *truncatellus*.

Parks (T. H.). **The Clover Leaf Weevil** (*Hypera punctata*).—*Jl. Econ. Entom., Concord*, vii, no. 3, June 1914, p. 297.

The Clover Leaf Weevil (*Hypera punctata*), common in the eastern States of America, has recently become abundant in a part of the Payette Valley in south-western Idaho. A field of red clover was eaten to the ground and surrounding lucerne seriously injured during April by the larvae of this insect. The clover and some of the lucerne were promptly ploughed to kill the larvae. There is no evidence

of the presence of the fungus, *Empusa sphaerosperma*, which effectively controls outbreaks of the insect east of the Mississippi, but its establishment in the Payette Valley is being attempted, though some anxiety is felt on account of the dry climate being possibly unfavourable to the rapid spread of the fungus.

BUTLER (H.). **An unusual Occurrence of Walking-Sticks.**—*Jl. Econ. Entom., Concord*, vii, no. 3, June 1913, p. 299.

During the summer of 1913, the woods in the vicinity of Peterson, Iowa, were infested with large numbers of a stick-insect, *Diapheromera femorata*. The woods consist chiefly of oak, with smaller numbers of elm, ash, aspen, linden, hickory, and black walnut, and have a heavy undergrowth of hazel. In May the hazel was covered with newly hatched insects, which in August began to leave the timber and appeared in the orchards, one tree of early apples being defoliated. By September, the foliage in the woods was destroyed in large patches.

TURNER (W. F.). **The Oak Scale (*Lecanium quercifex*, Fitch) and its control.**—*Alabama Agric. Expt. Sta., Auburn*, Circular no. 28, June 1914, pp. 105-110, 1 fig.

*Eulecanium* (*Lecanium*) *quercifex*, Fitch, the oak scale, is found throughout the United States and even in Canada, and has been taken on black oak (*Quercus velutina*), red oak (*Q. rubra*), scarlet oak (*Q. coccinea*), willow oak (*Q. phellos*), live oak (*Q. virginiana*) and white oak (*Q. alba*), besides the elm, iron-wood, and chinquepin. Its chief food-plant is the water oak (*Q. nigra*) and it is chiefly harmful in the South Atlantic and Gulf Coast States. The author points out that the dates given are probably late for South and early for North Alabama. Oviposition, which continues for three weeks, in 1911 commenced about 1st April, and in 1912 about 13th April. The average number of eggs laid by each female is about 4,000, and these hatch in about twenty-six days. The young nymphs are very active and may travel considerable distances before settling, and they are carried from tree to tree by birds, large insects, or perhaps by the wind. Examinations were made of several heavily-infested trees, and while the branches and twigs were covered with the migrating young, none could be found on the main trunk more than six inches from the bases of the branches and perhaps a foot from the nearest adult. It is doubtful whether the young ever crawl to the ground, at least, in the case of large rough-barked trees. Laboratory experiments showed that 42·2 per cent. of the nymphs that settled, did so on the upper surface of the leaves of water oak, and 57·8 per cent. on the lower surface—principally along the main or larger lateral veins, though experiments failed to determine the percentages of individuals which actually settled. The nymphs remain on the leaves until autumn, migration to the small twigs beginning at the end of September and continuing up to early winter, though probably a large percentage of the nymphs are shed with the leaves and never reach maturity. The young remain dormant on the twigs until February, when a rapid growth until the end of March begins. The female begins to lay eggs soon after attaining full growth, but the male and time of mating are unknown.

Two undetermined Hymenopterous parasites have been captured, one on the hibernating nymphs, and one on the eggs. *Chilocorus bivulnerus*, is also predaceous on the young stages. After somewhat extensive spraying experiments, the author recommends a thorough spraying in March, using any of the three following formulae: (*a*) Schnarr's Insecticide, 1 to 20. (*b*) Junior red engine oil, 2 gallons; whale-oil soap, 1 gallon; water, 50 gallons. (*c*) Diamond paraffin oil, 2 gallons; whale-oil soap, 1 gallon; water, 50 gallons. In preparing (*b*) and (*c*) the oil should be slowly added to the soap solution and when thoroughly mixed, about 3 quarts of water should be added slowly and the whole emulsified; dilute to 50 gallons and the mixture is ready for use. One thorough application every four or five years, wetting all sides of all twigs, will control this pest, as the scale spreads very slowly from tree to tree.

Crawford (D. L.). **A Monograph of the Jumping Plant-lice or Psyllidae of the New World.**—*U.S. Nat. Mus., Washington, D.C.*, Bull. no. 85, 3rd June 1914, 196 pp. 30 pls.

In this monograph a complete rearrangement of the genera of Psyllidae is presented, and the American genera have been arranged in six sub-families, viz.:—Liviinae, Pauropsyllinae, Carsidarinae, Ceriacreminae, Triozinae and Psyllinae. Some of these are new names, and those which have already been used have here different limits. The old subfamily, Aphalarinae, is not recognised, and the genus *Aphalara* has been transferred to the Liviinae, and the other genera formerly placed in it have been referred to Psyllinae or other subfamilies. After dealing with the morphology of these insects and their relations to other Homoptera, the author describes a large number of species, many being new. A very full bibliography (1840–1914) is appended.

Surface (H. A.). **A New Leaf Pest.**—*Wkly. Zool. Press Bull., Penns. Dept. Agric., Harrisburg*, no. 268, 15th June 1914.

An unusual outbreak is recorded in northern Pennsylvania of the Red Leaf Beetle (*Galerucella rufosanguinea*), which eats the foliage of cherry, peach, apple and grapes, and has already done such damage that it will seriously check the growth and development of the trees. Trees should be sprayed at once, using two pounds of lead arsenate in 50 U.S. gallons (42½ Imp.) of water, care being taken to reach both sides of the leaves.

Morgan (A. C.) & Parman (D. C.). **Arsenate of Lead as an Insecticide against the Tobacco Hornworms in the Dark-Tobacco District.** —*U.S. Dept., Washington, D.C.*, Farmers' Bull. no. 595, 15th June 1914, 8 pp., 2 figs.

In the "dark-tobacco" districts of Kentucky and Tennessee tobacco hornworms (*Phlegethontius quinquemaculata*, Haw., and *P. sexta*, Joh.), are the most serious problem of the tobacco-grower. Hand-picking being no longer practicable, owing to the scarcity and inefficiency of labour, growers have been forced to employ an insecticide.

Paris green was first used, but as it frequently burns tobacco severely and may reduce the value of the crop as much as 50 per cent., investigations during the past five years have resulted in arsenate of lead (diplumbic) being found to meet the requirements. The author describes and gives the results of experimental applications of this insecticide in both fine and rainy weather. Arsenate of lead should be applied in the form of a powder when there is no breeze and when dew is still on the plants. The quantity required varies from 3½ pounds to 5 pounds per acre, using a dust gun having a fan diameter of at least eight inches. When applied in powdered form it must be mixed with a carrier, the best found so far being dry wood-ashes, used in a bulk at least equal to the arsenate of lead. If applied as a spray, use 3 to 4 pounds in 100 (U.S.) gallons of water (85 gals. Imp.)

**The Use of Carbon Bisulphide in Emulsion at Martinique and Guadeloupe.**—*Agric. News, Barbados,* xiii, no. 317, 20th June 1914, pp. 202-203.

This article by G. Bordaz originally appeared in the Martinique newspaper, *La Paix,* for 9th and 14th May 1914. In Martinique, as in Guadeloupe, cacao, coffee, lime and other trees are destroyed by white grubs and by eel-worms. Amongst the former the most dangerous is the larva of a weevil, *Exophthalmus famelicus,* which causes the death of young cacao trees, and also attacks plantations of lime trees which have replaced sugar-cane ; for this reason it is said that cacao trees cannot succeed in land previously planted in sugar-cane. Eel worms chiefly attack Arabian or Martinique coffee and whole plantations have disappeared from this cause. It has been proposed to graft Liberian stocks, which, with Robusta coffee, is the only coffee left in Martinique, but simple treatment with carbon bisulphide would have eradicated both eel-worms and *Exophthalmus* larvae. The use of carbon bisulphide, however, has not become as general as was hoped, and as a result Arabian coffee has practically disappeared from cultivation, while in 1913 the output of cacao was about 27 tons less than the average export for the previous five years.

Emulsion pumps and soil injectors, which are recommended for use on large properties, are not always available to the small planter, and in the circumstances the most efficacious method is to pour the emulsion round the foot of each tree. An emulsion made with oil, which is very easy to use and less expensive than one made with alcohol, is prepared as follows : Equal volumes of carbon bisulphide and vegetable oil of the lowest quality obtainable (castor or cotton seed oil) are mixed together to form the stock solution. The dose of stock solution to be employed per plant should be poured into the requisite quantity of water, which has previously been rendered alkaline by the addition of 1½ oz. of carbonate of soda per gallon. For cacao the best time for treatment is during September and October, and those months which follow on the dry season in the case of coffee ; but it should be carried out in fine weather, when the dry soil will rapidly absorb the emulsion, for treatment in rainy weather is wasteful. In treating Arabian coffee for eelworm, the emulsion should contain 2 parts of stock solution to 1,000 of water, and with this the ground round the foot of

the tree wthin a radius of 16 inches should be soaked. To facilitate the penetration of the liquid the soil, which must be impregnated to a depth of 4 inches, should be stirred ; 4 to 10 pints of emulsion are required per tree, according to age. This quantity of carbon bisulphide will not suffice to kill *Exophthalmus*, and when treating cacao, double the strength is required. Round the stem of the tree make a trench 6 to 8 inches broad and 2 to 4 inches deep, according to whether the primary roots are found near the surface or not. To avoid wounding or barking them, no attempt should be made to uncover the lateral roots. After loosening the soil at the bottom of the trench, it should be filled with 4 parts of stock solution per 1,000 of water, using 4 to 10 pints, according to the size and age of the plant. As much as 18 pints may be used for the larger trees if sufficient water is available. Barbados prices are given for each constituent and the cost per adult cacao tree, using the stronger emulsion (1 gallon per tree), is a little over ½d.

*Exophthalmus esuriens.—Agric. News, Barbados,* xiii, no. 317, 20th June 1914, p. 203.

In 1912 *Exophthalmus esuriens* was found in St. Kitts associated with root-borer grubs in sugar-cane [see this *Review,* Ser. A, i, p. 165] and this year some 40,000 of these insects have been collected on cotton plants in fields adjoining those in which the sugar-cane was so severely attacked by root-borer. The grubs had completed their growth and development at the expense of the canes, and the adults, on emerging, had congregated on the cotton plants for the purposes of feeding and mating. About the same time these weevils made their appearance in great numbers in Montserrat, feeding on the leaves of limes and other citrus plants. During June a similar occurrence was reported from Antigua, where 47 acres of limes have been attacked, 7 acres badly, and where 23,400 weevils were collected in four days.

Boucher (W. A.). **Spraying.**—*Jl. Agric. Wellington, N.Z.,* viii. no. 6, 20th June 1914, pp. 648-649.

For mussel scale, red spider, and mealy bug, the author recommends spraying with emulsified red oil, the New Zealand winter formula for use when the trees are quite dormant, being as follows :—4 lb. special soft soap, 4 gallons red oil, 68 gallons water. The soap should be stirred to a lather in 2 gallons of boiling water and the oil added. This mixture should be emulsified by means of the spray-pump, and when the remaining 66 gallons are added, the mixture is ready for use. Early application (July or August) is recommended, as spraying with oil late in the season is apt to destroy the swelling buds. Some growers prefer to use the red oil in the proportion of 1 gallon of emulsified oil to 10 or 12 gallons of water.

The author emphasises the fact that with the steady expansion of the export trade each year it becomes more imperative than ever that orchard pests and diseases should be, as far as possible, eliminated.

Goodwin (B. G.). **The Fruit Crop.**—*Jl. Agric., Wellington, N.Z.*, viii, no. 6, 20th June 1914, p. 667.

Reporting on the condition of the fruit crop at the end of May for the Blenheim district, the author says that as considerable damage has been done by leaf-roller caterpillars, he has recommended spraying with arsenate of lead until the end of March, it being in that month that the pest seems to be at its worst. The fruit should be kept thinned, as the pest does most damage where apples are in clusters.

Littler (F. M.). **Woolly Aphis.**—*Weekly Courier, Launceston, Tasmania*, 25th June 1914. [Reprint received 14th August 1914.]

The author has successfully experimented with a painting mixture containing linseed oil, white lead and turpentine, applied with a moderately stiff brush, but not stiff enough to damage the fruit buds. The ingredients are costly, but the author thinks that this is an almost certain cure, as the turpentine penetrates the covering of the aphids and kills them quickly, while the white lead, besides being poisonous, covers the colonies with an airproof coating. A formula has not yet been decided upon, but the white lead should be mixed with sufficient linseed oil and turpentine to give the mixture a milk-like consistency. After referring to papers by Patch, Cadoret, Woodworth, Sevastjanov, Schneider-Orrelli and Poskin [see this *Review*, Ser. A, i, pp. 24–26 and 274; ii, pp. 4, 75–77, 152 and 176–177] the author suggests co-operation between fruit-growers and the Department of Agriculture with a view to tabulating the results of the various sprays and paints used against *Schizoneura lanigera*.

Davis (J. J.). **New or little-known species of Aphidae.**—*Canadian Entomologist, London, Ont.*, xlvi, nos. 2, 3, 4, 5 and 7, Feb., Mar., April, May and July 1914; pp. 41–51, 77–87, 121–134, 165–173 and 226–236, 5 pls., 9 figs.

The author in a series of papers deals with ten species of Aphididae, four of which are described as new, viz. :—*Macrosiphum creelii*, *M. venaefuscae*, *Symdobius albasiphus* and *Aphis pseudobrassicae*.

Savastano (L.). **Rapporti biopatologici della mosca delle arance (*Ceratitis capitata*, Wied.) e gli agrumi.** [Bio-pathological relations between the fruit-fly and citrus plants.]—*Ann. R. Staz. Speriment. Agrum. Fruttic., Acireale*, ii, pp. 97–128. [Reprint received 16th July 1914.]

Bio-pathological relations are simple between wild host-plants and the insects which attack them, but in the case of cultivated species, complications are introduced. The biology of *Ceratitis* has been fully studied from an entomological point of view, while the factors connected with the characteristics of the various species of *Citrus*, and the modifications produced by the grower and the intensity of cultivation, are little known. The author considers that local conditions may cause such variations in the biological relations between the fly and the plant that the attack of the insect may be possible in one region

and not in another, and that cultural conditions usually increase the susceptibility and only exceptionally assist the immunity of the Citrus trees. Any increase of sugar and consequent decrease of acidity in the fruit aggravates the attack. A bibliography of 47 works is appended to this paper.

Volkart (—). **Dommages culturaux.** [Injury to Crops.]—*Annuaire agricole de la Suisse, Berne,* xv, no. 1, 1914, pp. 4–6. [Received 30th July 1914.]

The following notes referring to insect pests are taken from Dr. Volkart's report in this publication of the "Département fédéral de l'Agriculture," which report covers the period from the 1st March 1912 to the 28th February 1913. Vines suffered only slightly from *Clysia ambiguella*, but Phylloxera showed an increase on 1911. Fruit trees were occasionally attacked by *Anthonomus* and *Hyponomeuta*, and *Cheimatobia* seemed to be more numerous.

Gough (Dr. L. H.). **The Fumigation of Citrus Trees.**—*Agric. Jl. of Egypt, Cairo,* iv, no. 1, June 1914, pp. 17–29.

Citrus trees in Egypt are liable to the attacks of *Chrysomphalus* (*Aspidiotus*) *aonidum*, *C. aurantii* and *Icerya purchasi.* Fumigation is chiefly used against *C. aonidum*, which is the most destructive of the citrus pests and attacks all kinds of citrus plants, mangoes, jasmine, roses, narcissus, camelias, vines, eucalyptus, *Ficus nitida* and other species of figs, bananas, soursops, guavas, ornamental palms, and many other plants. It has several generations during the year, but nearly all individuals which occur in winter are mature and lay their eggs from December to January.

Infection is so easily carried by dead leaves or infested fruit that fumigation can only cleanse an attacked tree and is no preventative against re-infection. It seems impossible to fumigate successfully a seriously attacked tree in one season.

Additional details as to the method of fumigating [see this *Review*, Ser. A, ii, p. 103] are given. For every tree, the volume enclosed by the fumigation sheet is calculated and the dosage for that volume found by reference to Woglum's table [Bull. 90, U.S. Bureau of Entomology.] To calculate the volume, paint a black line across the sheet, so that it reaches from side to side and passes through the centre of the sheet. Mark the centre of the line by a large black circle and from this measure off equal distances in feet along the line. To calculate the height of the tree, note what figure on the line lies on the ground on each side of the tree when the sheet is in position. The sum of the two figures is that which must be used in calculating the dosage. To obtain the circumference of the tree, measure round the foot of the hanging sheet with a tape measure.

Applications for fumigation, which is only carried out in Egypt by the Government, must be made to the Inspector of the province. Only trees under 13 feet high will be fumigated ; larger trees should be felled and burnt, or they should be cut down to 5 or 6 feet high, stripped of their leaves and treated with lime, salt and sulphur solution. This should be done in January or February.

SOUTH (F. W.). **Summary of Locust Work March 12 to April 30, 1914. Selangor.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 11, June 1914, pp. 294–297.

The author summarises the results of the thorough destructive methods which were employed against locusts in Selangor, in the spring of 1914. In one day 868 kerosene tins full of hoppers were caught in the Kajang district and the total catch from Kajang, Serdang and Singei Besi made from February 13th to March 31st was 11,445 tins full [see this *Review*, Ser. A, ii, p. 479.] The flying swarms began to appear early in April, but later in the same month the unexpected appearance of mature flying swarms and hoppers occurred, which the author believes must have been connected with two big swarms that disappeared in the jungle the previous January. In the Negri Sembilan State, where 35 acres of hoppers were successfully poisoned, the swarms were small, but numerous and often scattered, with the result that the work took longer than in Selangor. It has been found that a large swarm can be dealt with almost as fast as a small one, provided the ground is not difficult. The method of spraying poisons on the grass on which the locusts are feeding proved very successful in the Seremban district, where from 60–100 per cent. of each swarm so treated was destroyed. The author believes this to be the quickest and most successful method for small swarms scattered over large areas of lalang land. At present it is difficult to obtain a sufficient supply of molasses and when a coarse sugar was substituted for this it was not found so satisfactory.

NOEL (P.). **Les ennemis de l'artichaut** (*Cynara scolymus*). [Artichoke pests.]—*Bull. Trim. Lab. Entom. Agric. Seine Infér., Rouen*, no. 2, April–May–June 1914, pp. 14–15.

The chief insect pests of artichokes in Brittany are: *Cassida viridis*, L., *Aphis radicum*, G., *Aphis papaveris*, F., *Pyrameis cardui*, L., and *Xanthoecia* (*Gortyna*) *flavago*, Schiff.

DÉSOL (P.). **Notes biologiques sur la larve de *Tipula oleracea* à propos de ses ravages dans les prés de l'Avesnois, au printemps 1914.** [Biological notes on the larva of *Tipula oleracea*, injuring the meadows of Avesnois in the spring of 1914.]—*C.R. Soc. Biol., Paris*, lxxvii, no. 21, 19th June 1914, pp. 126–127.

In the spring of 1914, circular patches of from 15 to 60 feet in diameter, or the entire areas of meadows, were to be seen covered with yellow and dead grass, the roots of which were found to be full of the earth-coloured larvae of *Tipula oleracea*. Grasses and clovers are chiefly attacked, while plants with thick or hard roots are not affected. Where the infested zone borders on a furrow, the larvae fall into it during the night and being incapable of climbing out, may be collected in large numbers. They are not migratory so that healthy meadows may be found close to infested ones. Infestation is due to chance circumstances bringing fertilised Tipulids to the ground. The injury begins toward the end of winter, and the spring growth limits its spread, the

larvae being active from October to May. The only practical measure of control consists in deeply ploughing under the infested turf and in sowing in the months of March and April.

BERNARD (L.). **Technique des traitements contre les Insects de la Vigne.** [Technique of methods of control of insect pests of the Vine.] *Paris*: J. B. Baillière et Fils, 1914, 364 pp., 95 figs. Price, 6 fr.

The chief object of this book is the study of the two well-known pests, *Clysia ambiguella* and *Polychrosis botrana,* which have contributed to bring about a serious crisis in French viticulture during the past few years. Some 74 pages are also devoted to other insect pests of the vine. After giving an account of the history and distribution of *Clysia* and *Polychrosis* and describing and figuring the larvae, pupae and perfect insects of both pests, the author further describes *Sparganothis* (*Oenophthira*) *pilleriana,* and gives a table by which the various stages of the three species may be distinguished. The life-histories of these pests in relation to the vine are then discussed and a great mass of valuable information on the subject is given. In dealing with the destruction of the insects, the important effects of atmospheric conditions upon them is emphasised.

Particulars of various insect enemies are given, including *Malachius bipustulatus,* which penetrates into the cracks in the vine props and destroys a large number of pupae, *Clerus formicarius,* earwigs, certain *Hemerobius,* and *Discoelius zonalis.* Certain Myriapods and spiders also destroy fair numbers of larvae. The larvae are parasitised by various ICHNEUMONIDAE, and two Chalcids, *Caenacis parviclava* and *Eucomys swederi,* Dalm. (*Pteromalus vitis*), the latter being probably the more useful, while the eggs of both species are parasitised by *Trichogramma* (*Oophthora*) *semblidis.*

They are also subject to the attacks of the fungi, *Isaria farinosa* and *Sporotrichum globuliferum.*

The author then describes in minute detail the various mechanical methods for the destruction of the pupae. The use of shelter and light traps and the destruction of these pests by spraying and other chemical means are discussed at length, the necessity for combined effort in each district being urged as of vital importance.

The life-history of *Sparganothis pilleriana* is next dealt with in considerable detail and the methods of its control discussed, the collection of eggs and fumigation with sulphur in tents being chiefly recommended. *Euxoa* (*Agrotis*) *segetum* and *Feltia* (*Agrotis*) *exclamationis* and *A. pronuba* all do considerable damage in their larval state by eating the roots of vines in winter and the buds in summer. Their numbers may be reduced by placing shelter traps consisting of bundles of lucerne or of freshly-cut grass at the foot of each vine-stock. Collection of the larvae at night with a Haltica funnel has also been recommended. Amongst sprays, one composed as follows is said to be useful:—5 lb. potassium sulphide (liver of sulphur) and 10 lb. of soap in 10 gals. of water, used at night when the larvae are out feeding. A mixture of arsenite of copper, bran and treacle spread on the base of the vine-stock has been found useful in Australia.

The Vine Sphinx, *Pergesa elpenor*, is especially prone to attack vines trained "en espalier." Collection of the eggs and larvae appears to be the best means of checking the damage. In 1904, in Algeria, another Sphinx (*Deilephila lineata*) did a large amount of damage, but the larvae were ultimately got rid of by spraying with arsenite of copper. *Arctia* (*Chelonia*) *caja* is occasionally very harmful and appears to have a preference for clay soils.

Of the beetle pests, *Haltica ampelophaga* is very widely distributed in Spain, whence, the author thinks, it has invaded the South of France and Algeria. In the latter country before the introduction of arsenical insecticides it was a veritable plague. The fight against the pest is difficult on account of the extremely rapid rate of reproduction. Every year in Algeria and in the South of France, the insects are practically annihilated, but nevertheless every spring they reappear in large numbers. Its natural enemies are of small consequence and it is very difficult to find a practical method of attacking the hibernating insects, though something may be done by burning brushwood, shrubs and dry leaves. In 1887, the Government of Algeria made this destruction compulsory within a radius of 50 yards round the vineyards, but in spite of these drastic measures sufficient escaped to assure the reproduction of the pest. The use of the Haltica funnel and of arsenical insecticides are the most satisfactory methods of control.

*Adoxus obscurus* var. *vitis* at times does serious damage. The perfect insect makes its first appearance about the end of May, but the attack is especially visible at the end of June and July. The damage done to the leaves is not very important, but the grapes are sometimes gnawed to such an extent that the whole vintage is destroyed. This beetle occasionally abandons entirely an area in which it is swarming and it has been suggested that after a certain number of generations parthenogenesis occurs and the females migrate *en masse* to other localities. The only practical remedy against the pest is collection in funnels as used for *Haltica.* Details are given of the life-histories of three weevils, *Rhynchites betuleti*, *Otiorrhynchus ligustici* and *O. sulcatus.* One hundred species of the genus *Otiorrhynchus* are known in France and of these 25 attack the vine. The addition of 2 per cent. of bitter aloes to copper sprays against mildew is said to be useful against them.

The Longicorn, *Vesperus xatarti*, is not usually a very serious pest. Scraping the bark in February and searching for eggs in all likely places is an effective measure, and the injection of bisulphide of carbon into the soil is also useful against it [see this *Review*, Ser. A, i, pp. 190–191].

*Opatrum sabulosum* appears in the beginning of May and attacks only French-American grapes, having only become a pest of vines since the arrival of *Phylloxera.* The larvae of *Pentodon punctatus* also attack grafted vines, eating the new tissue around the graft and the young buds at their base. The only means of fighting it are the capture of the adults at sundown and the injection of bisulphide of carbon into the soil to kill the larvae.

Against *Lethrus cephalotes* the same remedies are applicable as against *P. punctatus.* *Anomala vitis* is common in the sandy soils on the shores of the Mediterranean and has the same habits as *Melolontha.* The adults should be collected and the injection of carbon

bisulphide and the mixing of lumps of calcium carbide or crude gas-liquor with the soil is useful against the larvae.

*Cneorrhinus plagiatus* (*geminatus*), known as a pest of vines since 1839, causes considerable damage by attacking the young buds, and is especially abundant on sandy soils. The best means of capturing the weevils is to use a Haltica funnel into which the vine-stocks are vigorously shaken.

The Locustid, *Ephippiger biterrensis*, is found all over the vine-growing districts of France and is exceedingly voracious; it will eat all kinds of plants and at times other insects. It frequently bites the labourers sleeping in the vineyards. Perhaps the best means of controlling these pests is by killing the perfect insects with wooden racquets as they fly off the plants. The Capsid bug, *Lopus sulcatus*, is very common in vineyards in the Department of the Yonne and the Cher. Collection of the perfect insects with Haltica funnels and painting the stocks and supports with sulphate of iron for the purpose of destroying the eggs, give good results.

*Pulvinaria vitis* is often very numerous on vines. As remedies, the removal of all old bark during the winter and painting the stocks with a 50 per cent. solution of sulphate of iron or a 4 per cent. solution of sulphuric acid in June, before the insects have acquired their shield, are recommended. The same remedies are applicable to *Eulecanium* (*Lecanium*) *persicae* and *Pseudococcus* (*Dactylopius*) *vitis*, which are also capable of doing considerable damage. The latter scale-insect is generally to be feared because it is the precursor of the fungus disease known as fumagine, which commonly develops upon the waxy substances secreted upon white scale. The grey scale, *Targionia* (*Aspidiotus*) *vitis*, is very common in the warmer districts, Nice, Algiers, Italy, etc., but is never very destructive. It has a formidable enemy in a small Hymenopteron, *Spilomena* (*Celia*) *troglodytes*, the female of which stores her nest with these scales.

Several pages of the book are devoted to *Phylloxera vastatrix*, and though an enormous number of remedies have been proposed against this pest, no really satisfactory one exists, excepting the use of American vine-stocks. *Dasyneura* (*Cecidomyia*) *oenophila* produces galls on the underside of the vine leaves, but seldom does serious damage. To those who are interested in vine pests, their life-history and the methods by which they may be combated, this book will constitute a mine of information and should be consulted in the original.

SAVASTANO (L.). **La poltiglia solfo-calcica e le cocciniglie degli agrumi. Riassunto.** [Lime-sulphur mixture and the citrus scale-insects. Resumé.]—*Boll. R. Staz. Speriment. Agrum. Fruttic., Acireale*, no. 12, May 1914, 5 pp. [Received 16th July 1914.]

The lime-sulphur mixture [see this *Review*, Ser. A, ii, p. 412] gives good results against *Chrysomphalus dictyospermi*, Mask., *Aspidiotus hederae*, Val., *Lepidosaphes beckii*, Newm. (*Mytilaspis citricola*, Pack.). Partial success is attained against *Saissetia* (*Lecanium*) *oleae*, Bern., but it is useless against *Pseudococcus citri*, Ris. Home-made mixture, especially when freshly made, is better than the commercial article,

and is a curative and not a preventive spray. The hot hours of the day should be avoided for spraying and very hot summer days, especially when the temperature is variable, are unsuitable.

Silvestri (F.). **Contribuzione alla conoscenza dei Termitidi e Termitofili dell'Africa occidentale. I. Termitidi.** A contribution to the knowledge of the Termites and Termitophilous Insects of Western Africa. I. Termites.]—*R. Scuola Sup. Agric., Portici*, 1914, 146 pp., 84 figs., 1 pl.

During the author's quest for fruit-fly parasites in Western Africa in 1912–1913 his spare time was mainly devoted to collecting Termites. He secured 119 forms, including sub-species, and varieties—six species from South Africa being included. Forty-five species and twenty-six varieties are described as new and ten new genera are founded. The geographical distribution of forms is as follows : Senegal, 14 forms ; French Guinea, 59 ; Gold Coast, 20 ; Dahomey, 5 ; Nigeria, 17 ; Kamerun, 25 ; Congo, 5 ; Angola, 6.

Chauvigné (A.). **A propos de l'hivernage de l'Eudémis.** [Concerning the Hibernation of *Polychrosis botrana.*]—*Rev. Vitic., Paris*, xli, no. 1068, 4th June 1914, p. 639.

The author has found that the pupae referred to in his previous article [see this *Review*, Ser. A, ii, pp. 539] are not those of *Polychrosis botrana.* The insect in question has been identified as the saw fly, *Emphytus calceatus*, Klug, and its presence in the old wood is probably due to an accidental choice of winter refuge, as it does not specially attack the vine.

Fabre (H.). **Les différentes variétés de soufre utilisées en viticulture.** [The different varieties of sulphur used in vine-growing.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 25, 21st June 1914, pp. 782–790.

The world's supply of sulphur comes from Sicily and Louisiana. The American product is slightly earthy in colour, owing to the presence of bitumen, but its purity is the same within 1 per cent. Sulphur may be had either ground or sublimated. As its efficiency in control depends on its fineness it is well to stipulate that the ground sulphur should pass a sieve of 100 or 110 meshes per 27 millimetres, and this fineness should be guaranteed. Only the best makers can supply the 110 quality. The sublimate is higher priced, but it is cheaper to use as it goes further, for 20 parts (by weight) of sublimate will replace 27 of the ground sulphur. An equal weight of sublimate is bulkier by about one-third. Microscopic examination is necessary to distinguish between the two varieties, and even this does not enable an admixture of ground sulphur to the sublimate to be detected if the addition is small. In the process of sublimation, it is impossible to avoid the formation of some crystals and, under the microscope, these look like pieces of ground sulphur. The law, in France, allows 10 per cent. of crystals to be present in the sublimate and good makes never contain so much. [See also this *Review* Ser. A. i, p. 291.]

**Situation des vignobles au 1er Juin.** [The state of the vineyards on the 1st of June.]—*Progrès Agric. Vitic., Montpellier,* xxxi, no. 25, 21st June 1914, pp. 775–779.

Pyralid larvae were numerous in the Aude and both *Clysia* and *Polychrosis* moths were noticed in numbers there. In the Côte-d'Or, *Haltica* appeared in large numbers at the time growth started, but seemed to be less numerous in the old centres of 1912 and 1913, this being probably due to treatment with copper-arsenic sprays. In Indre *Clysia* was numerous, and also a source of anxiety in Loir-et-Cher. In the Pyrenées-Orientales *Clysia* and *Polychrosis* were abundant.

Chauré (L.). **De la non-action du froid sur les insectes.** [The negative action of cold on insects.]—*Moniteur d'Hortic., Paris,* xxxviii, no. 12, 25th June 1914, p. 135.

In October and November 1913 there was a late outbreak of *Pieris brassicae* in the department of Vienne. Some of the larvae were still alive in January 1914 and many chrysalids were attached to outside walls without shelter. Though the thermometer reached freezing point they were in no way injuriously affected.

Cotte (J.). **Recherches sur la résistance des végétaux verts aux fumigations d'acide cyanhydrique.** [Researches on the resistance of green plants to fumigation with hydrocyanic acid.]—*C. R. Soc. Biol., Paris,* lxxvii, no. 22, 26th June 1914, pp. 185–187.

The author finds that some plants possess a remarkable power of resistance to hydrocyanic acid gas. The fumigating chamber used in his experiments measured 32 by 32 by 40 inches. The potassium cyanide contained 96·2 per cent. of the pure salt, producing an amount of gas practically equal to 40 per cent. of the weight of the cyanide. The apparatus was placed in a cellar of which the temperature was practically stationary at about 61° Fahr. and never exceeded 62°. The cyanide was placed in a dish containing sulphuric acid diluted to one-quarter strength. The author describes five of the experiments with doses of cyanide varying from 12·5 grammes to 39·06 grammes per cubic metre, such strengths being considerably stronger than those adopted in fumigation practice. Wheat is slightly affected by a 12 gramme dose, and is killed by a 2-hours exposure in an atmosphere containing the gas from 39 grammes of cyanide. The castor-oil plant first shows lesions at a 15-gramme dose ; 23 grammes are a sufficient strength to kill it more or less rapidly. The dwarf nasturtium resisted a dose of 15·51 grammes per cubic metre for 2 hours, but this seemed to be nearly a fatal dose.

de Charmoy (D. d'E.). **Report on a visit to South Africa.**—*Issued by the Department of Agriculture, Mauritius,* 15th May 1914, 12 pp. [Received 27th August 1914].

This is a detailed report on the visit of the Mauritius Government Entomologist to South Africa, where, from November 1913 to February 1914 he studied entomological problems. After describing

the fumigatoria and the plant importation and local quarantine measures, the author details the principal insect pests and their control in South Africa. An attempt to introduce *Novius cardinalis* into Mauritius from South Africa failed, but it is hoped that *Icerya seychellarum*, which attacks roses and other ornamental plants, will be checked by this Coccinellid once it is established. *Pseudococcus* (*Coccus*) *indicus* and *Pseudococcus* (*C.*) *capensis* will shortly be available for distribution, and it is hoped that these insects will be as effective against the prickly pear, *Opuntia monacantha*, as they have proved in experiments in South Africa. An unsuccessful attempt was also made to introduce a Hymenopterous parasite of *Sesamia vuteria* (*nonagrioides*) from South Africa.

de Charmoy (D. d'E.). **Report of the Division of Entomology for 1913.**—*Ann. Rept. Dept. Agric., Mauritius, for 1913*, pp. 10–12. [Received 5th October 1914.]

As in previous years [see this *Review*, Ser. A, i, pp. 28–31] the Dynastid beetle *Oryctes tarandus* was prevalent during 1913 on certain sugar estates, but the method of digging out the larvae was adopted more widely and has proved to be highly beneficial. The Melolonthid *Lachnosterna* sp. was found on sugar-cane in small numbers, control measures being responsible for a noticeable reduction. *Aphis sacchari* occurred in great numbers on two sugar estates, but by the middle of July all the insects were destroyed by a fungus. The white borer, the larva of a small, greyish moth, not yet determined, was very abundant throughout the island in virgin canes, while burning previous to cropping was suggested in order to protect the rattoons and to avoid the dissemination of *Chionaspis tegalensis*. A census of the area infected by *Phytalus smithi*, Arrow, made in May and June 1913, indicated that this pest was not spreading. During 1913 some 34 million insects were destroyed, against 15 million in 1912 and 24 million in 1911. The increase of captures in 1913 was probably due to the reward offered being higher than in 1912, and secondly, to a more thorough knowledge of the habits of the beetle. Up to the end of December 1913, some adults, chiefly males, of *Tiphia parallela*, Smith, had been observed in the insectary built for the breeding of this Scoliid parasite of *P. smithi*. Other insects damaging various crops were *Ceratitis capitata*, *Dacus ferrugineus*, *Agromyza phaseoli*, *Prodenia littoralis*, lawn cutworm (*Crambus* sp.), *Cratopus punctum*, *Adoretus versutus*, *Sphenophorus striatus* (banana borer), and *Coccus viridis* (*Lecanium viride*), besides numbers of other mealy bugs and scale-insects. Tomatoes were seriously damaged by the eelworm, *Heterodera radicicola*. The "lawn cutworm," which for the last few years has been a serious pest, was successfully controlled by means of an application of kerosene mixture made as follows: 1 part (by weight) of common soap is dissolved in 20 parts of water, 40 parts petroleum being gradually added ; to 24 parts of this emulsion add 16 parts Phenyl or 12 parts Creoline. A 2 per cent. solution of this mixture does not injure grass if applied at the rate of 11 gallons per 80 square feet for the destruction of subterranean caterpillars and *Oryctes* larvae.

**Сибирское Сельское Хозяйство.** [*Agriculture of Siberia*], *Tomsk*, no. 11, July 1914, pp. 323, 324, 326.

A note dealing with the state of crops in the government of Tomsk, says that locusts are reported from some localities of the Zmeinogorsk, Barnaulsk and Kainsk districts.

Another note gives a cheap remedy against insect pests, suggested by A. Stuptchenko in the Journal "Sadovod i Ogorodnik" (Horticulturist and Market-Gardener), who recommends collecting wormwood when it is still young and after drying it in the sun, cutting it into small pieces and boiling for some time in water. For the further use of this decoction two recipes are given: (1) 27 gallons of the decoction, with 10 lb. of green soap or 10 lb. of rye paste added, are mixed with a further 27 gallons of water and this mixture provides an excellent remedy against aphids. (2) 27 gallons of the decoction are dissolved in twice that amount of water, to which 27 gallons of poultry dung dissolved in water is added, as well as about 10 lb. of paste or molasses, to give it the necessary adhesiveness. This recipe is very effective against caterpillars and aphids, which are said to perish in a few minutes after spraying.

KITCHUNOV (N.). **Вопросы и Отвѣты.** [Queries and answers.]—**«Плодоводство.»** [*Fruit-growing*], *Petrograd*, no. 7, July 1914, p. 510.

Against the Coleopterous, Lepidopterous and Hymenopterous larvae which attack rose bushes, spraying with quassia, Paris green and other insecticides is recommended. With regard to pests, the larvae of which live inside the stem, such as those of the sawflies, *Monophadnus elongatulus* and *Tenthredo linda*, L. (*bipunctata*), spraying is useless. These pests, as well as *Argyrotoxa* (*Tortrix*) *bergmanniana* and allied species, can be successfully controlled by cutting away and destroying the shoots.

SACHAROV (N.). **Дѣятельность прокатнаго пункта по борьбѣ съ вредителями садоводства.** [The work of the (apparatus) hiring-station (in Astrachan) for the fight against agricultural pests **«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan*, no. 7, July 1914, pp. 467–468.

A hiring department for spray apparatus has been established by the Astrachan Entomological Station in the village of Moshaika, the Central Government granting a subsidy of £30. Fourteen sprayers and various other appliances were purchased and 4*d*. per diem was charged for hire; insecticides and fungicides were sold at the station at cost price. The station was established on 6th March 1914, and up to 25th July, it had sprayed 16,800 vines and 1,260 fruit trees, with the result that all the orchards in the village were at the moment free from pests, though they had suffered severely the previous year.

Plotnikov (N.). **Наставленіе къ распознаванію массовыхъ саранчевыхъ Туркестана.** [Instructions for the identification of the principal locusts in Turkestan.]—*Pubd. by the Turkestan Entomological Station, Tashkent,* 1914, 39 figs.

General information is given regarding the various stages, development and life-histories of the principal locusts found in Turkestan. *Locusta* (*Pachytylus*) *migratoria,* L., *Oedaleus nigrofasciatus,* de G. *Caloptenus italicus,* L., *Stauronotus maroccanus,* Thunb., *S. kraussi,* Ing., and another unnamed species of *Stauronotus* are figured and described, and data for the identification of the early stages are given, together with information as to the principal control measures.

Michailov-Doinikov (A.). **Нѣсколько словъ о вредителяхъ въ Харабалинскихъ садахъ.** [A few words on the pests in the orchards of Charabali].—**«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan,* no. 7, July 1914, pp. 471–472.

The following pests are recorded in the orchards and market-gardens of the village of Charabali :—*Hyponomeuta malinellus,* Zell., most of the pupae of which were parasitised, and *Euproctis chrysorrhoea,* L., occurred sparingly. *Cydia pomonella,* L., was the chief pest in the village, some orchards having one-third of their crop destroyed by it. *Eucosma* (*Tmetocera*) *ocellana,* F., did a considerable amount of damage, more so than in the previous year. Other pests were, the beetles, *Polyphylla alba,* Pallas, generally injuring apple trees, *Rhynchites auratus,* Scop., damaging from 5 to 40 per cent. of the fruit, *Cassida ferruginea,* Goeze, and *Anthonomus pomorum,* L. ; a bug, *Tingis piri,* Geoffr., chiefly on apple trees ; and a scale-insect, *Lepidosaphes ulmi,* L. (*Mytilaspis pomorum,* Bouché). In market-gardens the following pests of cabbages were recorded :—*Aphis brassicae,* L., *Pieris brassicae,* L., *Phyllotreta atra,* F., *Eurydema ornatum* and *Plutella maculipennis,* Curt. (*cruciferarum,* Zell.), the last-named being in great numbers.

**Отвѣты.** [Replies.]—**«Прогрессивное Садоводство и Огородничество.** [*Progressive Fruit-growing and Market-Gardening*], *Petrograd,* no. 28, 26th July 1914, pp. 902, 904.

In the control of *Melolontha melolontha* it is advisable to cover the soil with straw, leaving a few open spaces on which the beetles will oviposit, so that the eggs may be easily destroyed. The collection of the adults is best done in the morning, when, owing to the cold, they are unable to fly. Isolated " bait " trees should be planted near plantations which it is desired to protect. For poisoning the larvae, carbon bisulphide mixed with an equal part of kerosene is used ; balls of cotton waste are soaked in this mixture and are buried in the beds, this remedy being specially effective in sandy soil ; it should be applied early in spring. Insecticides should be used only on the leaves of plants on which the beetles feed. The following recipe is suggested : 1 lb. of Paris green, 2 lb. of freshly slaked lime, with some flour paste, in about 55 gallons of water. The " bait " trees are useful in this connection, as numbers of beetles can be destroyed by spraying them.

KONDRATIEV (P.). **Къ вопросу о борьбѣ съ вредными насѣкомыми.** [On the question of fighting insect pests.]—**«Прогрессивное Садоводство и Огородничество.»** [*Progressive Fruit-growing and Market-Gardening*], *Petrograd*, no. 30, 9th August 1914, pp. 933, 934.

The author is of opinion that fumigation ought to play a more important part in fighting various insect pests and parasites of plants; since smoke and poisonous gases are able to penetrate into all parts of the plants, which is not the case when sprays are used. Of the better known substances used for fumigation, viz.:—potassium cyanide, tobacco, tobacco extract, "mortaphis" and "aphitoxin," the first-named is not always easy to obtain, besides being dangerous in use, while smoke from tobacco extracts has not given good results. The two liquids, "mortaphis" and "aphitoxin," of which the latter is the cheaper, are evaporated by means of small lamps. Aphitoxin appears to contain camphor, and the necessity of experimenting with this substance as a material for fumigation is suggested. The following recipe for a preparation used with success in the author's hot-houses is given: A wine-bottle half-filled with equal parts of tobacco extract and quassia is filled up with crude spirit; this mixture is left for 10 to 12 days in a warm place and then, after dilution with an equal quantity of water, is evaporated to half its bulk, when the spirit evaporates and a watery extract of tobacco and quassia remains; to this a piece of camphor of the size of a walnut is added. This mixture is evaporated over a lamp in the hot-house over night. Another patent liquid called "ara," which is used for washing and spraying plants attacked by aphids and "red spiders," was also found effective against scale-insects.

PREDIT (P). **Борьба съ камашками (мелкими муравьями.)** [The fight against small ants.]—**«Прогрессивное Садоводство и Огородничество.»** [*Progressive Fruit-growing and Market-Gardening*], *Petrograd*, no. 30, 9th August 1914, p. 934.

The author has controlled a plague of ants in his orchard by means of bait traps consisting of plates filled with a mixture of sugar, water and Paris green. He has found this more satisfactory than pouring a 30 per cent. solution of formalin on the nests, which has also been recommended.

ORZHELSKY (K.) **Окуриваніе сада дымомъ отъ табачной пыли въ борьбѣ съ яблонной медяницею въ 1914. г. въ Щигровскомъ уѣздѣ.** [Fumigation of orchards with smoke from tobacco dust in the fight against *Psylla mali* in 1914 in the Shigrovsk district (govt. of Kursk).]—**«Прогрессивное Садоводство и Огородничество.»** [*Progressive Fruit-growing and Market-Gardening*], *Petrograd*, no. 35, 13th September 1914, pp. 1063–1062.

The control of *Psylla mali* by means of fumigation was only begun in the orchards of the Shigrovsk district (government of Kursk) in 1913 and the results for that year were not quite effective, which the author attributes to insufficient acquaintance with the methods of applying this remedy. This pest has multiplied enormously during

late years in the above district and great damage has been done yearly. In 1914, fumigation was undertaken in two large orchards, each of about 30 acres and each surrounded on three sides by small plots of forest. The pests were on the wing after the 30th May and fumigation was carried out on the 3rd and 4th June, and over a month later no *Psylla mali* were to be seen. The total cost of the remedy, including tobacco dust, straw and the wages of six workmen and one foreman, amounted to about 1*s.* 3*d.* per acre. The author describes the manner in which the fumigation was carried out, which, allowing for the local method of planting, necessitated some variations from the procedure suggested by Dobrodeev [see this *Review*, Ser. A, ii, p. 258]. The fumigation should be done in the evening, immediately after the pests are on the wing, and before they have oviposited. In order to prevent the insects escaping from the orchards, fumigation should begin round the outside of the orchard, the heaps of tobacco dust in the middle being fired later.

CAMERON (A. E.). **A Contribution to a Knowledge of the Belladonna Leaf-Miner,** *Pegomyia hyoscyami,* **Panz., its Life-History and Biology.**—*Ann. App. Biol., Cambridge Univ. Press,* i, no. 1, May pp. 43–76, 1914, 2 pls., 4 figs.

There is great confusion in the literature on this species, owing to the fact that it has a considerable number of food-plants and has been described several times under different names. There appears however to be a distinct variety which particularly attacks beet and mangolds and periodically causes great damage to these crops both in Europe and America. The author's observations are based upon specimens reared upon Deadly Nightshade (*Atropa belladonna*). This insect is widely spread throughout Europe and it is probably to be found wherever beet, spinach and mangolds are cultivated. A list of food-plants, chiefly among the Chenopodiacae and the Solanaceae, is given and a statement by Jablonowski quoted, that if the natural food-plants should fail, the larvae may complete their development on a diet of manure or decaying vegetable matter. The eggs, larva, puparium and adult are described. Variation in the size and structure of the mature larvae appears to depend to a considerable extent upon the food-plant.

The eggs are laid on the underside of the leaf in parallel rows and are held together by cement. They hatch at intervals of from 4 to 6 days, generally in the cool of the evening. The larva eats its way into the parenchyma, slowly making a gallery for itself. When a large number of eggs are laid on one leaf, many of the larvae die from want of food, and those which hatch first appear to have the best chance of survival. The larval stages are apparently three, with two moults, though Carpenter has suggested that there are possibly four moults, but the author has not been able to verify this. In the month of June development was completed in about 10 days, while in September as many as 12 days were required. The pupal stage may be two or three weeks, or even longer. The insects hibernate as pupae, and larvae collected during October assumed the resting condition on the 20th of that month, and from one of the puparia, which were kept amongst damp sand in a cool house, an adult emerged on May 24th of the following

year. The manner in which the adults escape from the puparium is described. They live ordinarily about two weeks, but if fed on sugar in confinement life may be prolonged to three weeks. There are three broods in the year, but there is a good deal of overlapping of the various stages, owing to differences in the times of emergence, so that eggs, larvae, pupae and adults are all found to occur simultaneously from June to September.

The buccal-pharyngeal apparatus is described and its anatomy compared with that of *Pegomyia bicolor*, Wied., and *P. nigritarsis*, Zett. With regard to remedies, manuring in autumn rather than in spring is recommended. Spraying with paraffin emulsion, 8 parts of water, 1 part of soap and 4½ parts of paraffin, has been found efficient. Deep ploughing in order to bury the puparia and thus render the emergence of the adults difficult is only considered useful in light soils. The following emulsion is said to be effective in preventing oviposition, if applied early in the season :—Two pints of paraffin are added to 4 parts of soft soap and the mixture brought to the boil ; a small quantity of boiling water is then stirred in and the whole well mixed until a good emulsion is obtained ; to this 4 ounces of 95 per cent. of nicotin are added and the whole made up to 100 gallons by the addition of more water. If kept well corked in a drum, the mixture can be stored and used at any time, and is suitable as a fine spray. The cost of this mixture works out at about 3*s*. 9*d*. per 100 gallons. Three species of parasitic Hymenoptera were reared from the puparia of *P. hyoscyami.* Of these, two were Braconids belonging to the genus *Opius*, one of them being *O. nitidulator*, Nees. The third, which was comparatively rare, was a Proctotrupid, probably a hyper-parasite of one or both of the two species of *Opius*. The percentage of parasitism was rather high, and, as the season advanced, increased in intensity from about 14 per cent. in July to a much as 43 per cent. in September. The hibernating pupae do not appear to be heavily attacked. Damp weather is said to have the effect of reducing the number of parasites, but the author's observations in 1912 and 1913 showed that the difference was not very marked. Experiments as to the migration of these insects from one host plant to another did not produce evidence that this transition takes place with the abruptness which many authors assume. Fertilised females, reared from larvae which had been fed on belladonna leaves, were placed in breeding cages containing fresh mangold plants, but in no instance were eggs deposited. The converse experiment, from mangold to belladonna, had the same negative result. The author thinks it possible that within the limits of a single polyphagous species certain well defined " biologic " species may be established, each of which shows a marked tendency towards a particular food-plant. Differences between the imagos of *P. hyoscyami* fed on henbane and belladonna are clearly observable. At Dartford, Kent, where henbane and belladonna are grown commercially and close together, it has been found that in some years as much as 80 per cent. of the former crop is damaged, while the latter remains unaffected, but when henbane is absent, belladonna is quite attractive to the fly. It has been suggested to the author by Dr. Imms that *P. betae* is a species confined to the Chenopodiaceae and *P. hyoscyami* a second species confined to the Solanaceae, and he thinks it possible that these are physiological species which have undergone

more or less morphological separation. A very complete bibliography is given and the structural details of the fly and its larva are fully illustrated.

Barker (B. T. P.) & Gimingham (C. T.). **The Action of Bordeaux Mixture on Plants.**—*Ann. App. Biol., Cambridge Univ. Press*, i, no. 1, May 1914, pp. 9–21, 6 figs.

The authors have made a number of observations on the effects of Bordeaux mixture upon the tissues of plants with which it comes into contact in the process of spraying. Injury to foliage by Bordeaux mixture has been the subject of a good deal of investigation, especially in America. It was found very difficult to obtain any number of apple leaves which were quite free from injury of some sort, and it was therefore necessary to grow foliage specially protected from liability to injury. As the result of investigations it appears that cells with readily permeable walls (such as germ tubes of fungus spores, root hairs, the interior tissues of leaves, etc.) exert a considerable solvent action on the particles of the copper compounds with which they come in contact, resulting in rapid absorption of the dissolved copper, followed by death of the cells. In the case of injured foliage such action results in scorching.

The amount of inter-action between other types of cells and the copper compounds is determined by the nature of the cell wall. Direct absorption of copper by leaves of certain types takes place with or without local injury, depending on the nature of the leaf surface. Transference of the absorbed copper to other parts of the plant may follow. Copper may be absorbed through the roots of certain plants (potatoes, beans) with local injury to the root. This absorbed copper can be transferred to parts of the plants above ground without injury to the cells through which it passes.

Theobald (F. V.). **Notes on the Green Spruce Aphis (*Aphis abietina*, Walk.).**—*Ann. App. Biol., Cambridge Univ. Press*, i, no. 1, May 1914, pp. 23–36, 10 figs.

During 1913 a very severe attack of the *Aphis* described by Walker in 1849 as *Aphis abietina* took place on spruce trees. The insect is described and figured, and a list is given of localities in which it has been found in the United Kingdom. The trees of the genus *Picea* are unquestionably its normal food-plants, but it has also been taken by the author on Scots pines on six occasions and once on a Weymouth pine at Wye. It has been found on *Picea excelsa*, *P. sitchensis*, *P. pungens*, *P. engelmannii*, *P. nigra*, *P. alba*, *P. gigantea*, *P. rubra*, *P. morinda*, *P. monstrosa*, *P. omorica*, *P. kosteriana*, *P. glehire* [? *glehrii*]. *P. polita*, *P. hondoensis*, *P. alcoguiana* and *P. alaskiana*, but in some places *P. omorica* appears to be immune. Speaking generally, the Sitka spruce is most damaged, but this is not always the case. Two markedly different effects are produced by this aphis. In *P. sitchensis* the damaged needles soon fall, and complete defoliation results. In *P. excelsa* the needles turn brown, but the majority remain on the tree, which looks as if it has been scorched by fire. *P. morinda* and *P. glehire* [*glehrii* ?] are only partially defoliated, though this is not the case with *P. engelmannii* and *P. kosteriana*.

In young specimens of *P. excelsa* the needles do not turn brown, but are mottled with yellow spots.

The author has been unable to find any sexuparae, but the apterous forms are found from early January throughout the year into December. The first winged forms were observed in Woking on March 20th. At Wye they were never noticed until June, but were numerous in July and August. Apterous viviparous females occur throughout the winter and occasionally produce young. The apterous form is generally found along the needles, one on each, giving rise to a colony of young, which spread out and adopt the same habit, and where the apterous mother feeds a yellow spot occurs. They do not appear to attack the new growth to any extent in summer, but may be found on it in small numbers in autumn and winter. Though this aphis has a large number of natural enemies, few, if any, parasites or predaceous insects attack it in winter when its numbers are few, nor do they appear until June and July, long after most of the damage has been done. Later in the year they are preyed upon by two species of PHALANGIDAE and the adults and larvae of a species of *Scymnus*. The most interesting enemy of this aphis is the long-eared bat, which was seen hovering over and clinging to the branches of infested trees, and when shot was found to contain hundreds of both winged females and the apterous and nymphal forms. Other enemies included two Chalcids, several Syrphid larvae, and *Adalia bipunctata*.

In plantations preventive measures would not repay the cost, but in nurseries or on isolated trees there is no great difficulty in destroying this pest. Various washes were tried, of which the most effective were: Paraffin jelly, nicotin and soft soap, quassia and soft soap, and such patent washes as White's Abol, MacDougall's Summer Wash, and Cook's Tobacco Wash. A very fine spray, applied with force, should be used, and the foliage thoroughly wetted. Winter treatment with strong paraffin-jelly yielded good results and will probably prove to be the best method of control.

DEAKIN (R. H.). **The Caterpillars attacking the oaks of Richmond Park, with an account of an experimental spraying with Lead Chromate.**—*Ann. App. Biol., Cambridge Univ. Press,* i, no. 1, May 1914, pp. 77–84, 8 pls.

The oak trees of Richmond Park have suffered very extensively of late years from the attacks of Lepidopterous larvae, the maximum damage occurring about June. The Ham Cross Plantation, consisting of about 400 large oak trees planted in 1825, was chosen for experiment, and upon them in the third week of April the following larvae were found:—

NOCTUIDAE: *Calymnia trapezina*, L. GEOMETRIDAE: *Oporabia dilutata*, Bkh., *Hybernia defoliaria*, Cl., *Cheimatobia brumata*, L. SPARGANOTHIDAE: *Batodes* (*Capua*) *angustiorana*, Hw. OLETHREUTIDAE: *Eucosma* (*Spilonota*) *ocellana*, Schiff., *Gypsonoma dealbana*, Fröl. (*incarnana* Hw., nec Hb.). TORTRICIDAE: *Tortrix viridana*, L., *T.* (*Pandemis*) *ribeana*, Hb., *Cacoecia* (*Tortrix*) *podana*, Sc., *C. xylosteana*, L., and *C. lecheana*, L. COLEOPHORIDAE: *Coleophora lutipennella*, Z.

*C. trapezina* and *Oporabia dilutata* were not numerous and could hardly be classed as pests. *Hybernia defoliaria* ranked next in importance after *C. brumata* and *T. viridana*, which, especially the former, caused the bulk of the damage.

No parasite of *C. brumata* was observed, but of 60 pupae of *T. viridana* collected at the beginning of June five were parasitised, two by an Ichneumon (*Pimpla arctica*), one by a Braconid (*Meteorus laeviventris*, Wesm.), and two by Tachinid flies, one of which was hatched out and identified as *Thryptocera pilipennis*, Fln. On May 6th and 7th the trees in the Ham Cross Plantation were sprayed with the following :—Lead chromate 100 parts, soft soap 50 parts, gelatine 3 parts, water 47 parts, at a cost of £5 per cwt. One pound of this paste was used in 30 gallons of water, this giving 1 lb. of lead chromate to every 60 gallons of spray, the results being satisfactory.

MOLINAS (—). **Sur un parasite des oeillets cultivés.** [A pest of cultivated carnations.]—*Jl. Agric. pratique, Paris*, xxvii, no. 19, 7th May 1914, pp. 662–663.

Carnations cultivated on the coasts of Provence and of Italy are often seriously attacked by a small Lepidopteron, *Tortrix pronubana*, of which four generations occur annually, viz., in February, March, April ; May, June ; July, August ; and September, October. The female lays batches of from 30 to 80 eggs, and the larvae live in the leaves and in the flowers. The author has collected a number of parasites which aid greatly in controlling this pest. At the present time, however, the sole measure employed consists in the destruction of the larvae by hand. Where carnations are cultivated as annuals, the plants should be destroyed at the close of the season. Fumigation with nicotin, bisulphide of carbon, hydrocyanic acid, etc., is not considered effective.

MALAQUIN (A.) & MOITIÉ (A.). **Les Hyménoptères parasites de l'*Aphis euonymi*, F. (Puceron noir de la betterave).** [Hymenoptera parasitic on *Aphis euonymi*, F. (the black aphis of the beet).]—*C. R. Soc. Biol., Paris*, lxxvi, no. 16, 15th May 1914, pp. 803–805.

The authors have so far observed 17 species of Hymenoptera which attack *A. euonymi*.—APHIDIIDAE : one species near to *Praon abjectus*, Hal. ; *Trioxys auctus*, Hal., *Trioxys heraclei*, Hal. ; *Aphidius crepidis*, Hal., *Aphidius urticae*, Hal., and two other species of *Aphidius*. PROCTOTRUPIDAE : *Lygocerus antennalis*, Kief., *Lygocerus rufipes* Thoms. Two undetermined species of SCELIOLIDAE. CYNIPIDAE : *Allotria minuta*, Hart., and two other undetermined *Allotria* ; *Alloxysta crassa*, Cam. CHALCIDIDAE : two undetermined species, one belonging to the genus *Encyrtus* and the other to the genus *Pteromalus*.

*Trioxys auctus* and *Aphidius crepidis* are the commonest species. They almost exclusively attack the apterous Aphids. *T. auctus* develops in 3 weeks, as compared with 15 to 18 days required by the Aphid. In autumn, the last surviving Hymenoptera attack the females of the Aphid, which are then on the spindle tree (*Euonymus europaeus*). Their parasitised bodies remain on the branches until the spring and the parasites hatch out late in March or early in April, unparasitised *A. euonymi* having already appeared early in March.

*Allotria* nymphs are protected by the dried integuments of their host, whilst *Trioxys* have, in addition, a white, silken cocoon. Two of the authors' experiments were as follows :—On the 9th and 10th June 1913, they released 20 *T. auctus* in a breeding cage in which two beets were placed, on the leaves of which about a thousand *A. euonymi* were feeding. On the 2nd July over 500 Aphids were parasitised and dead. In the second experiment about a thousand *Aphidius crepidis* and *Trioxys auctus* were released early in July in the small garden of the laboratory, where tens of thousands of Aphids lived on the spindle tree and on a number of intermediate plants, such as sugar and seed beet, *Lysimachia vulgaris*, *Epilobium spicatum*, nettles, etc. By the 15th August it was impossible to find a single healthy Aphid.

Barbey (A.). **Les Bostryches.** [Bostrychidae.]—*Bull. Soc. Etude Vulg. Zool. Agric*, *Bordeaux*, xiii, nos. 3, 4, 5 & 6, March, April, May & June 1914; pp. 41–45, 55–62, 74–81, 94–96; 22 figs; 1 pl.

Eighty to ninety species of Bostrychidae occur in the forests of Central Europe, where they are the most dangerous of the xylophagous pests. According to Shevirev, in the case of the more important species such as *Ips* (*Tomicus*) *typographus*, L., and *Hylurgus* (*Myelophilus*) *piniperda*, L., an examination of the galleries is sufficient to determine whether a tree has been attacked before or after felling. In the first case, a blade of grass introduced into the bore-hole will follow the direction of the grain, whilst in the second it will point in various directions, usually transverse. In the plains, *Ips typographus* swarms towards the end of April if the weather is fine. The first generation completes its cycle in from 10 to 13 weeks, the second generation appearing at the end of August. Severe infestation may cause the insects to attack healthy trees for lack of suitable weak specimens. The only direct control at present available consists of trapping by means of felled trees. If the trunks are barked at the time that oviposition takes place, the larvae and eggs are soon destroyed by sun and rain, though the adults are less easily killed.

Picard (F.). **Les insectes du groseillier et du framboisier.** [Gooseberry and raspberry pests.]—*Progrès Agric. Vitic.*, *Montpellier*, xxxi, no. 23, 7th June 1914, pp. 713–720, 1 pl.

The following insects chiefly attack the raspberry :—*Agrilus chrysoderes* var. *rubicola* and *Bembecia hylaeiformis*; whilst *Pteronus ribesii*, *Abraxas grossulariata*, *Halia wavaria*, *Aegeria* (*Sesia*) *tipuliformis* and *Eulecanium* (*Lecanium*) *corni* are almost exclusively pests of the gooseberry. *A. chrysoderes* var. *rubicola* is a Buprestid which lays its eggs in the bark and the young larvae of which bore into the stems, and as one individual is able to destroy an entire stem, it causes severe losses in the raspberry fields of the Côte-d'Or. It is frequently parasitised by the Chalcid, *Entedon* (*Tetrastichus*) *agrilorum*. When pruning in winter, all stems which show signs of the larva being present must be cut as close to the ground as possible and burnt.

Towards the end of May, just before the adult insect appears, the canes should be again inspected and stems bearing galls destroyed. *Bembecia hylaeiformis* appears as an adult from June to August. Its larva bores into the stems of the raspberry and sometimes perforates the root, where it is far more difficult to deal with. Infested stems should be cut and burnt. *Bracon minutator*, *Colpognathus celerator*, *Centeterus major*, and *Meniscus bilineatus* are some of the many parasites of this pest. *Pteronus ribesii* is the chief Tenthredinid pest of the gooseberry. This saw-fly has two generations, the imagines appearing in April or May, and again in July. The first generation of larvae appears in May and June, the second in August and September. Fortunately a large number of parasites attack *P. ribesii*, including the Tachinid fly, *Degeeria flavicans* ; the Proctotrupids, *Diplolepis* (*Cleptes*) *nitidulus* and *Omalus auratus* ; the Ichneumons, *Tryphon ambiguus*, *Mesoleius* (*Tryphon*) *armillatorius*, *M. bipunctatus*, *M. grossulariae*, *Polysphincta ribesii* and *Perilissus limitaris* ; and the Bracon, *Pygostolus sticticus*. A cheap and satisfactory control measure consists of shaking the larvae on to sheets spread on the ground, or the bushes may be sprayed with water and a mixture of lime and soot may then be put on the foliage. Emulsions of petroleum and soap also give good results. *Emphytus grossulariae*, *Macrophyga ribis*, *Nematus consobrinus*, and *Perineura solitaria* are other Tenthredinids injurious to the gooseberry and should be dealt with in the same way. Many of these larvae, in particular those of *Emphytus*, pass the winter in stems of which the pith is easy to pierce, but they do not otherwise attack the raspberry, vine, etc., which shelters them, and cannot be considered to be pests of these plants. The adult *Abraxas grossulariata* appears from June to August ; it oviposits on the leaves and branches of the gooseberry, the larva hatches in September and feeds on the leaves until it hibernates, the main injury occurring in spring. The larvae of *A. grossulariata* are controlled by numerous Hymenoptera, including *Ichneumon comitator*, *I. scutellator*, *I. bilineatus*, *I. trilineatus*, *I. ochropis*, *Pimpla examinator*, *P. instigator*, and the Bracons *Microgaster rufiventris*, *Apanteles* (*Microgaster*) *gagates*, and *A. congestus* (*M. perspicuus*). The life-history of the V-moth, *Halia wavaria*, is similar to that of *A. grossulariata*. It occasionally attacks the fruit. Its parasites have not been observed. The Geometers, *Eupithecia assimilata*, *Lygris associata*, and other Lepidoptera are also found on the gooseberry, while *Cidaria albicillata* occurs on the raspberry. The control measures used for Tenthredinids are also applicable here. *Aegeria* (*Sesia*) *tipuliformis* larvae live in the stems of the red gooseberry and of the black currant. Pupation takes place in the bore-hole and the imago emerges in May. Control measures are the same as for *Agrilus chrysoderes*.

**Insecte qui attaque les graines de féveroles.** [A pest of horse-beans.]—*Jl. Agric. pratique, Paris*, xxvii, no. 24, 11th June 1914, p. 765.

When the larva of the Tineid moth, *Endrosis lactella*, occurs in horse-beans, it may be destroyed by heating at a temperature of from 122° to 140° Fahr., for a sufficient time to ensure that each seed is heated right through. As *E. lactella* attacks many varieties of grain, store-rooms should be fumigated for 48 hours with sulphur.

*Tortrix rosana*, L., **injuring pear trees.**—*Jl. Agric. pratique, Paris*, xxvii no. 25, 18th June 1914, pp. 800–801.

In dealing with *Tortrix rosana*, L. (*T. laevigana*, Schiff.), which injures pear trees, the employment of natural enemies is recommended. Instead of burning the injured leaves, they should be placed in tubs covered with wire gauze, sufficiently fine to permit the parasites, but not the moths, to escape. The mesh should be about 2 to 3 millimetres ($\frac{2}{25}$ths to $\frac{3}{25}$ths of an inch). Sprays are only useful if applied early.

Aaronsohn (A.). **L'Olivier en Palestine. Ennemis de l'Olivier.** [The olive in Palestine. Olive pests.]—*Rev. Agric. Vitic. Afr. Nord, Algiers*, xii, no. 119, 20th June 1914, pp. 590–594, 1 fig.

Locusts are only an occasional pest of the olive in Palestine, their last appearance dating 10 years back. At the present time the larvae of *Zeuzeura pyrina* cause the most anxiety. They first appear in February or early in March, and may then be easily destroyed before injury is done to the tree. They soon attack the young branches, and thence bore into the larger branches and into the trunk. The larvae take 2 or 3 years to develop and during that period much weaken the trees, sometimes killing them. The best method of control consists in introducing capsules of carbon bisulphide into the bore-holes and then sealing them with putty. Natural enemies are unknown, though some dead larvae appear to have been killed by a fungus. No *Zeuzera* larvae have been noticed on wild olive-trees, but only on those of foreign origin. Holes made by *Hylesinus fraxini* are often noticed on trees weakened by *Zeuzera*, but never on healthy trees. *Dacus oleae* is a pest of wide occurrence and only controlled by natural enemies. *Saissetia* (*Lecanium*) *oleae*, the olive Psylla (*Euphyllura olivina*), *Prays oleellus* (*Tinea oleae*), *Margarodes unionalis*, and *Paloeothrips oleae* are other pests of less importance.

Parker (J. R.). **The Sugar-beet Webworm.**—*Montana Agric. Expt. Sta., Bozeman*, Circular no. 42, June 1914, pp. 75–86, 6 figs.

In Montana the sugar-beet webworm, *Phlyctaenodes sticticalis*, L., is abundant over all the sugar-beet territory, where in some instances it has already reduced the tonnage 25 per cent.; the most extensive and injurious outbreak occurred early in the summer of 1912. The author refers to the studies of Paddock [see this *Review*, Ser. A, i, pp. 40–42] and gives a full description and life-history. Parasites and birds are useful in the control of this pest and the author, while dealing with the influence of weather conditions, says it is noted that in 1912 a severe hailstorm killed great quantities of half-grown larvae. Ploughing, trap lanterns and irrigation ditches [see this *Review*, Ser. A, ii, p. 361] are control methods recommended, as well as the following spray: Paris green, 1½ lb.; soap, 3 lb.; water, 50 gallons. The author describes a small, cheap sprayer which may be fitted up from an ordinary one-horse two-row beet cultivator, but for larger fields, of 20 acres or more, geared traction sprayers are the best. It is very important that beets be sprayed while the larvae are small; places where moths are first noticed should be examined 10 days later, and if eggs or larvae are found operations should commence immediately.

**Contra as formigas.** [Control of Ants.] *O Fazendeiro, S. Paulo*, vii, no. 5, May 1914, p. 168. [Received 17th October 1914].

The editor says that calcium carbide is largely used in Cuba with excellent results for exterminating ants and strongly recommends the method, which is as follows :—A funnel-shaped hole is made in the top of the ant-hill, in which some lime is placed and cold water poured upon it. About an hour later some pieces of calcium carbide are dropped into the hole, more water poured upon it and the hole filled up. The acetylene gas develops, penetrates through the nest and kills the ants.

Bailey (V.). **The Wild Cotton Plant** (*Thurberia thespecioides*) **in Arizona.**—*Bull. Torrey Bot. Club, New York*, xli, no. 5, May 1914, pp. 301–306, 2 figs.

*Anthonomus grandis* has been found abundantly on wild cotton in the canyons of the Santa Catalina, Rincon and Santa Rita Mountains of S. Arizona, but not north of the Gila River.

Lockhead (W.). **A Synopsis of Economic Entomology.**—*Macdonald College, Quebec*, n.d., 113 pp. [Received 19th October 1914.]

This is a handbook published for class use and is divided into 4 parts. Part I. is devoted to the structure, anatomy and development of insects, with chapters on harmful and beneficial species. Part II. consists of a key to insects injurious to farm, garden and orchard crops arranged under 15 heads according to the crops concerned. Part III. comprises a classification and description of common insects with a key to the orders and principal families of economic interest. Part IV. contains an outline of the general principles involved in the control of injurious insects.

Butler (O.). **Bordeaux Mixture: I. Physico-chemical Studies.**—*Phytopathology, Baltimore, Md.*, iv, no, 3, June 1914, pp. 125–180.

The results are given of detailed investigations into the chemical and physical properties of Bordeaux mixtures. The Bordeaux mixtures practically employed are of three types: (1) Acid Bordeaux mixture ; to 100 parts of a 1 per cent. to 2 per cent. neutral Bordeaux mixture add 0·1 to 0·2 parts copper sulphate previously dissolved in 10 parts water. (2) Neutral Bordeaux mixture ; copper sulphate, 1 part ; milk of lime, sufficient to produce alkalinity ; water to make up 100 parts. (3) Basic Bordeaux mixture ; copper sulphate, 1 part ; quicklime, 0·5 to 1 part ; water to 100 parts. It is a great saving to have stock solutions made up in the ratios in which they are required for the above mixtures, and the following stock formulae are recommended :—(1) For acid Bordeaux mixture: (*a*) copper sulphate, 20 parts, to water, 100 parts ; (*b*) quicklime, 90 per cent. pure, 7 parts, to water, 100 parts ; (*c*) copper sulphate, 20 per. cent. sol., 10 parts, to water, 100 parts. (2) For neutral Bordeaux mixture : (*a*) copper sulphate, 20 parts to water, 100 parts ; (*b*) quicklime, 90 per cent. pure, 7 parts, to water, 100 parts. (3) For alkaline Bordeaux mixture : (*a*) copper sulphate, 20 parts, to water, 100 parts ; (*b*) quicklime, 90 per cent. pure 10 to 20 parts, to water, 100 parts.

## NOTICES

**The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.**

**Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.**

**The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.**

**All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.**

## CONTENTS.

VOL. II. Ser. A. Part 11.—pp. 625-672. NOVEMBER, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

FERNALD (H. T.). **Report of the Entomologist.**—*26th Ann. Rept. Massachusetts Agric. Expt. Sta., Amherst, Part I,* January 1914, pp. 55a–58a. [Received 19th October 1914.]

After briefly outlining the investigations during 1913, the author says that during that year *Prospaltella perniciosi* [see this *Review*, Ser. A, i, p. 160] has been very abundant, and has in many cases parasitised over 90 per cent. of the San José scale on the branches of the plants examined; it has also been reported from Connecticut, New York and Pennsylvania.

**Cyaniding to Destroy Mealy Bug.** [Correspondence.]—*Gardeners' Chron., London,* lv, nos. 1414, 1416, 1417, 1418, 1420, 1422, 1424 and 1432, 31st January, 14th, 21st, 28th February, 14th, 28th March, 11th April and 6th June; pp. 75, 106, 135, 151, 189, 223, 256 and 398.

This correspondence, on the difficulties experienced by growers when cyaniding vines to destroy the mealy bug, emphasises the necessity for repeating this process several times and shows that failures are often due to the impurity of the materials used. Details are given for producing hydrocyanic acid gas [see this *Review*, Ser. A, i, pp 312-313], the ingredients being used in the following proportions: Cyanide of potassium 1, sulphuric acid $1\frac{1}{2}$, water 3. The required amount of water should be placed in a glass or glazed porcelain vessel so large that when the acid and cyanide are added, it is not more than half full. Add the acid (commercial sulphuric acid sp. gr. 66 Beaumé) and immediately afterwards the cyanide, of not less than 98–99 per cent. purity. The quantities advised for every cubic metre of space are:—10 gms. cyanide of potassium, 15 gms. sulphuric acid and 30 gms. water.

BYAS (L. P.). **Report of the Fifth Annual Meeting of the American Phytopathological Society**—*Phytopathology, Baltimore, Md.,* iv, no. 1, February 1914, pp. 45–46.

*Tylenchus dipsaci*, Kühn. (*T. devastatrix*, Kühn.), known in Europe since 1858 as a pest of lucerne, clover, rye, oats, onions, potatoes, hyacinths and many other wild and cultivated plants, has been found for the first time to be attacking hyacinths in Washington. Probably it has been imported in hyacinth bulbs from Europe.

LAKIN (G. L.). **Борьба съ вредителями въ Астраханскихъ виноградникахъ.** [The fight against pests in the vineyards of Astrachan.]—**«Садоводъ.»** [*The Fruit-Grower*], *Rostov-on-Don,* no. 2, February 1914, pp. 114–126; no. 3, March, pp. 273–276; no. 4, April, pp. 336–340; no. 5, May, pp. 428–432; no. 6, June, 484–491, and no. 7, July, pp. 524–529.

This series of articles gives a historical review of the measures against various fungous and insect enemies conducted in the vineyards of the government of Astrachan for a number of years. These pests

cause a loss of 35 per cent. or even 50 per cent. of the vintage, and vineyards which some years ago yielded from $3\frac{1}{2}$ to 6 tons per acre now only yield from $2\frac{1}{2}$ to 3 tons.

*Polychrosis botrana*, which has been known in the vineyards since 1865, is the cause of considerable damage, amounting in 1902 to over £30,000. Control measures against this pest in Astrachan consisted in the removal of the damaged grapes during June and July and again during the vintage, these periods corresponding with the presence of the two generations of caterpillars. Laborde considered spraying with Paris green to be as injurious to the vines as to the caterpillars, and suggested spraying with substances which form a varnish over the vine clusters and thus suffocate the insects in all their stages. Among other remedies he recommended :—Catching the moths early in May and again in the first half of July by means of special lamps, surrounded by tins filled with water, and washing or spraying branches after the vintage with water at a temperature of 80° C. (176° F.), care being taken not to damage the "eyes" of the yearling shoots and directing the water principally on to the bark of the old wood as well as over the supporting stakes, in the cracks of which the cocoons are mostly found.

In 1903, and again in 1910, the Board of Agriculture sent Y. F. Schreiner specially to Astrachan, and he was of opinion that *Polychrosis botrana* destroys not less than one-third of the yearly vintage in that region, and occurs there in three generations; the first one living on weeds, the second on the green grapes, and the third on the ripening grapes. Measures must be directed in the first instance against the first generation, against which he recommended spraying with Paris green and lime ($2\frac{1}{4}$ oz. of green and about 1 oz. of freshly slaked, fat lime in 8 gallons of water), to which some rye paste (about 10 oz. to every 7 gallons of water) is added to make the mixture adhesive. The first spraying must be done in May, immediately after the white webs connecting the buds of the inflorescence indicate the presence of the young larvae. Two more sprayings at intervals of 5 to 6 days are necessary in order to reduce the numbers to a minimum and thus prevent an outbreak of the second generation. If necessary, the same insecticide can be applied in June, also in three sprayings. Schreiner pointed out that scorching with Paris green is not possible when the insecticide is prepared with fat, lump lime, slaked just before the mixing takes place ; he has also applied Paris green with salammoniac ($1\frac{1}{2}$ oz. of green are dissolved in a small amount of salammoniac and added to 27 gallons of water) and another insecticide (consisting of $1\frac{1}{2}$ oz. of white arsenic in powder and double that amount of freshly slaked lime boiled together for 15 to 20 minutes in 27 gallons of water) for spraying fruit trees, but has not tried the effect of either of these insecticides on vines, and was therefore unable to recommend them. It might be admissible, instead of spraying, to dip the branches in the insecticides, although this method is less practicable. Vine-growers are warned against the use of trap lamps, as the insects are attracted only to the spaces illuminated by the light, but not to the lights themselves nor into the water surrounding them.

In 1912, *Polychrosis botrana* appeared in nearly all the vineyards of Astrachan, and as much as 75 per cent. of the grapes in some cases were infested. Hitherto no radical remedy against these pests has

been discovered, and he considers that burial of the infested grapes still constitutes the most effective remedy, though the Department of Agriculture recommends spraying with Paris green.

In the next chapter the author describes the proposals which have been put forward for the prevention of the importation of Phylloxera into the vineyards of Astrachan. In 1911, many vineyards round Astrachan were investigated for Phylloxera, the total number of vine stocks examined being over 150,000, but no traces of Phylloxera were found, and accordingly the import of vine-stocks, etc., from other parts of Russia and from abroad has been prohibited, except from places also free from these pests.

Besides *Polychrosis botrana*, the following pests were also observed on vines in 1912, without, however, great damage being done by them: the beetles, *Rhynchites betuleti*, *Epicometis* (*Cetonia*) *hirta* and *Lethrus cephalotes*, and a hawk-moth, *Pergesa elpenor*.

EDWARDS (J.). **Celery Disease.**—*Gardeners' Chron., London*, lv, no. 1420, 14th March 1914, p. 189.

At Birriew, Wales, celery was seriously attacked by the Dipteron, *Acidia heraclei*, in the autumn of 1913. As *Cnicus arvensis*, (creeping or corn-thistle) is commonly attacked by *A. heraclei*, it should not be allowed to become abundant in the neighbourhood of celery plants, as had happened on this occasion.

HEMPEL (A.). **A Lagarta do Milharal.** [The Millet Caterpillar].—*O Fazendeiro, S. Paulo*, vii, no. 3, March 1914, p. 110. [Received 17th October 1914.]

The larva of *Remigia repanda*, F., which has been known in Brazil for at least 12 years, has recently appeared in many parts of the country and there is reason to fear a general invasion of this serious pest. The larva chiefly attacks graminaceous plants, especially guinea grass, millet and sugar-cane, and has several generations in the year. Plantations should be kept very clean and all weeds and rubbish where the adults are likely to oviposit, should be removed. A useful insecticide consists of 2 lb. of Paris green in 100 gallons of water to which is added 2 lb. of soap, 4 lb. of sugar or 10 lb. of molasses to increase the adhesiveness. The Paris green should be of good quality and contain at least 50 per cent. of arsenic. When pasture land, guinea grass or other dwarf crops are attacked, spraying with Paris green (1 part in 1,000 of water) is sufficient. If the attacked crop is of small value, and especially if the pests are in the chrysalis stage, its destruction is strongly advised. The attack of the pest can be limited in a single plantation by ploughing one or more trenches round it, making their inner walls as nearly vertical as possible. A line of quicklime laid all round the plantation is also a good method of protecting it from invasion. When a plantation of millet is invaded, the caterpillars advance rapidly, but if taken in time a large amount of the crop may be saved by cutting down the plants in front of the line of march and digging trenches in their way.

Zappelli (P.). **Contro un insetto dannoso.** [Against an injurious insect.]—*L'Agricoltura Sabina, Poggio Mirteto,* xiii, no. 4, 30th April 1914, p. 18.

The author refers to the method of trapping mole-crickets in holes filled with dung [see this *Review*, Ser. A, i, p. 496], and recommends the destruction of the nests, which should be done in mid-June when the injured grass and the galleries reveal their presence. On digging the nest out, a small, compact mass of earth about the size of the closed fist, containing from 160 to 400 eggs, will be found.

Paernio (P.). **Enfermedad de los Narranjos en la Provincia de Chincha.** [Disease of oranges in the Province of Chincha.]—*Boletín Minist. Fomento, Caracas,* ix, no. 10, April 1914, pp. 707–714. [Received 14th August 1914.]

Oranges in the Province of Chincha (Venezuela) have been attacked by Coccids, against which a kerosene-soap emulsion is stated to have proved an efficient control. The emulsion is prepared with 2 parts of kerosene and 1 of a 6 per cent. soap solution. The resultant creamy mixture is diluted with 10 times its bulk of water.

**The Market-Fruit-Garden. Does Spraying for Apple-sucker pay?** [Correspondence.]—*Gardeners' Chron., London,* lv, nos. 1428 and 1430, 9th and 23rd May 1914, pp. 309–310 and 349.

A serious attack of the apple-sucker, *Psylla mali,* is recorded in the South of England in April and May, which was not unexpected, because swarms of the *Psylla* had been noted in the winter. This pest is worst on old trees and generally on varieties with short-stalked blossoms; Beauty of Bath, Lord Derby, Lady Sudeley, Lord Grosvenor and Lane's Prince Albert were all severely attacked. Capsid bugs are also recorded. [See this *Review,* Ser. A, ii, p. 658]. In spraying against the apple-sucker, it is better to drench the trees with a weak wash than to spray lightly with a strong one, the quantity of wash used being of more importance than the force applied. With soft water, 6 lbs. of good soft soap, or with hard water 8 lbs., to 100 gallons should suffice. Another wash of $\frac{1}{2}$ fluid oz. of domestic cloudy ammonia to the gallon, with the soft soap, is recommended, but neither of these washes are completely satisfactory.

Brotherston (R. P.). **Mealy Bug on Vines.** [Correspondence.]—*Gardeners' Chron., London,* lv, no. 1430, 23rd May 1914, p. 349.

When the mealy bugs *Pseudoccus citri* and *P. longispinus* occur on vines in May, they are better destroyed by vaporising a 49% nicotin extract than by cyanides, because young vine leaves are very susceptible to the latter. Nicotin of the above strength has been used successfully on vines. As the mealy bugs usually appear on the young wood of the previous year, it is advisable to cut off the snags close to each lateral. Ants in a vinery should be destroyed at once, as their presence often precedes an attack of mealy bug.

FULLAWAY (D. T.). **Tobacco Insects in Hawaii.**—*Hawaii Agric. Expt. Sta., Honolulu,* Bull. no. 34, 25th May 1914, 20 pp., 9 figs. [Received 28th October 1914.]

*Elydna* (*Caradrina*) *reclusa* is the cutworm most commonly found in the tobacco fields in Hawaii and is a recently introduced species, probably from Fiji. The duration of the larval stage is from 30 to 40 days, pupation taking place an inch or two below the surface of the soil, the moth emerging 12 or 14 days later. Owing to the ravages of this species six or seven replantings are often required to secure a crop, in spite of the thorough distribution of poisoned bait and of hand picking. Inability to control the cutworms in these plantations is due largely to the rocky and unworkable land. With thorough cultivation, cutworms become almost a negligible quantity after the lapse of several years, except for occasional outbreaks which, in the case of most species, are of rare occurrence. Next to thorough cultivation the best artificial control of cutworms consists of distributing about the plants a poisoned bait consisting of white arsenic or Paris green in moistened and sweetened bran, flour, or middlings. The edges of fields adjacent to uncultivated land are often trenched, so as to present a steep surface on the exposed side which the cutworm cannot climb. Handpicking, sometimes resorted to, is slow and expensive. Parasites are fairly efficient throughout the year, and include the Tachinids, *Frontina archippivora* and *Chaetogaedia monticola,* the ichneumon, *Polyophineta* (*Ichneumon*) *koebelei,* and the egg-parasite, *Trichogramma pretiosum.* The last-named, or *T. flavum,* which is perhaps identical with *T. pretiosum,* has been bred from the eggs of a Noctuid, probably *Laphygma* (*Spodoptera*) *exigua.* Birds also devour large numbers of cutworms and should be protected.

*Phthorimaea operculella,* the tobacco splitworm, was first noticed in Hawaii in 1892. This species is most injurious to seedling plants, but this may be partly overcome by seeding the beds very thinly and protecting them from the moth with cotton netting. The damage is usually slight on well-conducted plantations. The larvae are protected in their tunnels, but when deserting an old mine for a new one are vulnerable to lead arsenate dusted or sprayed on the plants, and this measure is recommended for their control in seed-beds. No solanaceous plants should be grown near the tobacco fields and all solanaceous weeds in the immediate vicinity should be periodically destroyed. The larvae are very much parasitised by a Braconid, *Chelonus blackburni,* which also attacks a number of other small leaf-rolling caterpillars. The parasitised caterpillars spin their cocoons when about half-grown, without pupating, and shortly afterwards the larva of the parasite emerges from the caterpillar, and feeding on it externally, kills it and spins its own cocoon inside that of its host. The parasite emerges a little later than the moth would have done. A native ichneumon, *Limnerium blackburni,* is also parasitic on *P. operculella.*

The larva of *Chloridea* (*Heliothis*) *obsoleta* bores into and eats the seed pods of tobacco and also eats the foliage to some extent. In Hawaii it is never found on either maize or cotton and is not generally considered a serious pest of tobacco, as its multiplication is probably checked by natural enemies. It is the general

practice of planters to top the plants as soon as the flowers appear, and where this is done consistently, there is little evidence of this pest; to obtain seed, the flower stalks are usually enclosed in a bag. As neglected fields always show signs of the borer, the plants in abandoned fields should be ploughed up and destroyed to avoid a general infestation. *Frontina archippivora* has been bred from the pupa of *C. obsoleta*, the eggs of which are probably parasitised by *Trichogramma pretiosum*.

The tobacco hornworm, *Protoparce* (*Phlegethontiusquin*) *quemaculatus*, is sometimes found on the wild tobacco (*Nicotiana glauca*), but its rare occurrence would indicate the presence of efficient parasites. Infested plants should be sprayed with lead arsenate—3 pounds to 100 U.S. gallons (83 Imp. gallons) of water.

Both the larva and adult of the tobacco flea-beetle (*Epitrix parvula*) are injurious, and also feed on potatoes, tomatoes, egg-plant, etc. In some places this beetle becomes numerous and injurious only in the dry season, but in neglected plantations, and especially in the neighbourhood of other solanaceous plants, it is very prevalent. In Hawaii the life-cycle would probably be somewhat shorter than in the United States. When this beetle is present in sufficient numbers to damage the crop, the affected plants may be sprayed with arsenate of lead, in paste form, 1 pound to 20 U.S. gallons (16½ Imp.) of water, (only one-half of this amount of powdered arsenate of lead), which will kill any beetles feeding on the sprayed foliage.

Minor pests of tobacco include the larvae of *Plusia chalcytes* and *Amorbia emigratella* (SPARGANOTHIDAE); the Coccids, *Pseudococcus citri*, *P. virgatus*, and *Pulvinaria psidii*; the Orthoptera, *Elimaea appendiculata* and *Xiphidium varipenne*; the Lygaeid bug, *Nysius delectus*; and a bark beetle, *Xyleborus* sp.

The only pest of stored tobacco mentioned is the cigarette beetle (*Lasioderma serricorne*), against which fumigation and cold storage [see this *Review*, Ser. A, i, p. 171] are recommended; the natural enemies include a species of *Pteromalus*.

VUILLET (J. & A.). **Les Pucerons du Sorgho au Soudan Français.** [The Millet Aphis in the French Sudan.]—*L'Agron. Colon.*, *Paris*, i, nos. 11–12, ii, no. 13, 31st May–30th June–31st July 1914; pp. 137–143, 161–165, 17–23; 8 figs.

Failures of the Sudanese millet crop are chiefly due to drought or to the attacks of aphids, *Aphis sorghi*, Theo., and *A. maidis*, Fitch, being responsible for the injury in the latter case. *A. sorghella*, Schouteden, is considered to be a synonym of *A. sorghi*, which has been found only on sorghum (*Andropogon sorghum*, Brot.). In the Koutiala-Bani district, *A. sorghi* was noticed on old stools on the 14th June, a time at which the year's sorghum sowings were already sufficiently advanced to shelter the insect. Thus the one host-plant alone suffices to support the existence of this species. In the French Sudan, parthenogenetic viviparous females, winged or apterous, reproduce continuously. Laboratory experiments show that apterous individuals live from 24 to 28 days. Five days after birth they begin to produce larvae at the rate of from 5 to 10 every 24 hours during from 8 to 10 days. Fertility then decreases rapidly and ceases about

18 days after birth. *A. sorghi* secretes a sugary substance, on which a rather dense fungus growth develops, which is attractive to numerous Diptera and Hymenoptera and to an ant of the genus *Acantholepis*. *A. maidis* was found both on maize and sorghum, but appears to prefer the latter. It seems to be most abundant in the middle of the rainy season (July-August). Laboratory experiments show that *A. maidis* lives about 30 days. Larvae are produced after 5 days at the rate of from 4 to 6 every 24 hours during from 9 to 12 days. After this, fertility rapidly decreases and ceases about the twentieth day of life. Migratory individuals acquire wings in about 5 or 6 days and produce new larvae within 24 hours. In one case the winged form occurred after three apterous generations, in another four successive generations were bred without obtaining winged insects. Natural enemies abound, and the following list only includes those noticed at Kouli Koro :—Coleoptera : *Chilomenes vicina*, Muls., *Exochomus flavipes*, Thunb., var. *troberti*, Muls., *Scymnus plebeius*, Weise. Diptera : *Paragus serratus*, F., *P. borbonicus*, Macq., *P. longiventris*, Lw., *Xanthogramma aegyptium*, Wied., *Leucopis* sp. Neuroptera : *Chrysopa incongrua*, Nav., *C. oralis*, Nav., *C. vuilleti*, Nav. Regarding the Chrysopidae, it is difficult to decide whether they are really beneficial or injurious, but the authors incline to the latter view. One entomophytic fungus has been noticed in the Sudan. Many *A. maidis* are destroyed by the rains, while *A. sorghi* suffers when a very dry winter causes the sorghum stubble to wither and die rapidly. From a practical point of view, control need be undertaken against *A. sorghi* alone, as the injury due to *A. maidis* is not of economic importance. The use of insecticides need not be considered, so far as the Sudanese regions are concerned. Control should be based on two facts : that *A. sorghi* confines itself to sorghum, and that the enemies of *A. sorghi* multiply not only at the cost of *A. maidis*, but also of *Siphonophora leptadeniae*. All the old stools of sorghum should be dug up and burned immediately after the harvest. Plantaations which have remained unproductive, and consequently unharvested, should be dealt with at an earlier date. Where sorghum is very badly attacked it should be replaced by the small millet (*Pennisetum spicatum*). Land shaded by trees with dense foliage (*Ficus*, *Cola cordifoila*, *Parkia*, Tamarind, etc.) should not be sown with sorghum, as no good crop will be produced and the stems neglected by the cultivator will prove a breeding place for aphids, unless the district is one of those where stubble destruction is compulsory. The method of indirect control by planting *Leptadenia lancifolia*, Decaisne, is described and a description of *Siphonophora leptadeniae*, sp. nov., is given [see this *Review*, Ser. A, ii, pp. 396, 588].

P. F. **Genossenschaftliche Bekämpfungsversuche des Heuwurms mit Nicotinbrühe zu Grevenmacher.** [Co-operative trials in controlling the first generation of the vine moth with nicotin at Grevenmacher.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 11, 1st June 1914, pp. 170–172.

In Luxemburg two vine-growers' syndicates have undertaken control of *Clysia ambiguella* in two localities. In one of these spraying began on 22nd May, though very few moths had been found in the trap-pots and captures were decreasing in spite of the warm weather.

This comparative reduction in the number of moths has also been noticed elsewhere in 1914 and Feytaud ascribes it to an increase of fungus parasites [see this *Review*, Ser. A, ii, p. 589]. Control, however, should not be neglected in any case. In the above experiment it was found that one man was able to spray with care 1,200 stocks in 10 hours, about 22 gallons of spray solution being used. Though the results are not yet visible, it is considered proved that a control of the vine moth is feasible in practice.

Chiari (D. M.). **Un nemico del giardino. La criocere del giglio** (*Crioceris merdigera*). [A garden pest: the Lily Beetle (*Crioceris merdigera*).]—*Riv. Agric., Parma,* xx, no. 23, 5th June 1914, p. 365.

The lily beetle, *Crioceris merdigera,* is common in gardens from mid-April, or March in mild climates, until the end of May. The eggs are laid on the underside of the leaf, and the larvae protect themselves against the sun and their foes by a covering of their own excreta, so as to resemble small balls of dirt. They feed on the leaves, stems, and inflorescences of the lily. Pupation takes place in the soil. Destruction by hand of the egg, larva and adult is the only efficient control, and is not difficult. The eggs are easily seen on the underside of the leaves, the larvae are secured by plucking the infested leaves, whilst the adults may be collected without difficulty in the early morning.

**Some data relating to vine pest control.**—*Weinbau der Rheinpfalz, Neustadt a. d. Hdt.,* no. 12, 7th June 1914, pp. 132-136.

The second generation of *Clysia ambiguella* is only found on the grapes, but the first generations also attack the tender shoots and leaves. Besides the vine, the vine-moth has other host-plants on which it can develop normally, including wild vines, clematis, ivy, elder, etc., but even if such hosts are present, control in the vineyards should never be given up. An ordinary high pressure sprayer, with a bent nozzle permitting spraying from beneath, will cover an acre in 2 days, which is much less than the time occupied when revolving sprayers are used.

**Bericht über die voraussichtliche Steinobsternte 1914.** [Report on the stone-fruit crop expected in 1914.]—*Schweiz. Zeitschr. Obst.- u. Weinbau, Frauenfeld,* xxiii, no. 11, 13th June 1914, pp. 162–169.

*Cheimatobia brumata,* L., is mentioned in one-half the reports on stone-fruits received from various districts in Switzerland. It is pointed out that this pest is easily controlled by means of banding.

Jordan (—). **Ueber das Auftreten von** *Dactylopius vitis,* **Niedelsky.** [The occurrence of *Dactylopius vitis,* Niedelsky.]—*Weinbau der Rheinpfalz, Neustadt a. d. Hdt.,* ii, no. 13, 14th June 1914, p. 141.

At the Neustadt Zoological Station many vine leaves have been recently received infested with *Pseudococcus* (*Dactylopius*) *vitis,* Nied.

This pest is easily seen on the underside of the leaves on account of its white woolly secretions. The larvae hatch in July and after living on the leaves, migrate to the old bark, cracks in the vine-stakes, etc., in search of a winter refuge, where they spin a thick, white web. Early in spring the female attacks the young vine-shoots, and when mature, migrates to the leaves to oviposit. In the Palatinate this pest of French vineyards has not yet done much harm, but control measures ought to be at once adopted. Spraying with nicotin on the underside of the leaves should be carried out in summer, while in winter the stocks should be scrubbed. The vines should be trained on wires.

**Narcissus Fly**—*Gardeners' Chron., London,* lv, no. 1434, lvi, no. 1438, 20th June, 18th July 1914, pp. 1435 and 58.

Further correspondence on *Eumerus strigatus*, Fall. [see this *Review*, Ser. A, ii, p. 89] provides additional evidence that the Narcissus fly enters its host at the neck of the bulb and that there are at least two broods of flies in the year ; larvae which had been submerged in water for 72 hours were observed to hatch out successfully. One observer states that in partially infested bulbs *E. strigatus* feeds only on the rotting portions and may therefore prove to be more beneficial than harmful.

Candidus (A.). **Ueber Mottenfang (mit Klebfächern) in Rhodt.** [Moth captures in Rhodt by means of sticky racquets.]—*Weinbau der Rheinpfalz, Neustadt a. d. Hdt.*, ii, no. 14, 21st June 1914, pp. 157–158.

Since 1903 the vine-growing village of Rhodt has had a 75-acre plot on which experiments are made in capturing the vine-moth with sticky racquets, carried out by school children. The period of operations lasts from 8 to 14 days, according to weather conditions. Each child is paid about 2½*d*. per evening and prizes are distributed to the most successful. This year some 100,000 moths, mostly *Clysia ambiguella*, were taken on 97 racquets in 10 days. As a measure complementary to winter treatment, this system is to be strongly recommended.

Dern (—). **Zur Reblausbekämpfung in der Rheinpfalz.** [*Phylloxera* control in the Palatinate.]—*Weinbau der Rheinpfalz, Neustadt a. Hdt.*, ii, no. 15, 28th June 1914, pp. 165–169.

Some success is said to have been achieved in the control of *Phylloxera* in Bavaria. Between 1895 and 1911 about 225 acres of vineyards were examined, stock by stock, in two infested localities. From 1874 to 1911 the cost of examination and control amounted to about £114,000 and about 200 acres were found to be infested. The vineyards of Bavaria cover about 55,000 acres and the wine produced is worth about £1,250,000 per annum.

Zappelli (P.). **Un nuovo nemico degli ulivi.** [A new pest of olive trees.]—*L'Agricoltura Sabina, Poggio Mirteto,* xiii, no. 6, 30th June 1914, pp. 25–26.

The bark of the trunks and branches of olive-trees in some parts of Central Italy has been found to become detached after swelling and

then splitting. Under the injured bark the author has noticed galleries containing larvae about two-fifths of an inch long, which he believes to be those of a Lepidopteron, very similar to those of the grain moth. Young trees with a soft and sappy bark are mostly attacked, while young branches on old trees appear to be immune. The transition to the adult state takes place late in February or early in March. A mixture of iron-sulphate and lime solution, containing 10 lb. iron-sulphate and 20 lb. lime in 20 gallons of water, painted on at the end of winter, should prevent oviposition.

Maynè (R.) & Vermoesen. **Le "Sahlbergella singularis" et le Chancre du Cacaoyer au Mayumbe.** [*Sahlbergella singularis* and Cacao canker in Mayumbe.]—*Bull. Agric. Congo Belge, Brussels,* v, no. 2, June 1914, pp. 261-281, 7 figs.

Six species of Hemiptera injure cacao in Mayumbe, producing spots on the pods and cankers on the branches. Of these *Sahlbergella singularis* is the most dangerous and seems to confine its attacks to cacao both in the larval and adult stages. The eggs are thought to be laid in the cankers or in the peduncle of the pod. They hatch at the beginning and at the end of the rainy season, October–November and April–May, the adults being most numerous at the end of April or early in May, and comparatively rare in the dry season. *Sahlbergella* larvae are very sluggish and the adults rarely fly further than from one tree to another, but they may be carried further by the wind. This pest is widely distributed, especially in old plantations, but has not been noticed on estates under three years of age. It is nocturnal in its habits and chiefly attacks the pods, tree stems, leaf-petioles and fruit peduncles, but not the leaves. The injury done to the pods and branches, which is minutely described, seriously affects the productiveness of the trees and is also thought to shorten their life. It is also feared that instead of bearing for from 15 to 20 years, infested trees will become unproductive after 10 years.

Other Hemiptera causing canker on cacao include *Helopeltis* sp., and *Atelocera serrata*, F.

To check the ravages of *Sahlbergella* or other Hemiptera and also secondary fungus pests, a combination of Bordeaux mixture with petroleum soap emulsion is recommended. Wounds should be smeared with vegetable tar (coal tar being less suitable), and dead twigs, branches, etc., should be collected and burned.

Gillette (C. P.). **Two Colorado Plant Lice.**—*Entom. News, Philadelphia,* xxv, no. 6, June 1914, pp. 269–275, 1 pl.

In 1908, the author recorded under the name *Schizoneura populi*, Gill., winged migrants of *Asiphum pseudobyrsa*, Walsh, found in company with an apterous form of a species of *Chermes* upon the bark of the Balm of Gilead (*Populus balsamifera*) which were taken to be the alate forms of the same louse. The apterous form is now considered to be a new species, to which the name *Chermes populi* is given; the alate form being unknown, though the apterous lice are very common on cotton-wood bark in Colorado. *Asiphum pseudobyrsa* has been taken from the leaves of *Populus coccinea* and is a true *Asiphum*.

*Phyllaphis quercifoliae*, sp. n., is described, and was taken on native scrub oak in Colorado. It was very abundant, infesting for the most part the under side of the leaves.

ESMENARD (G.). **Le tignole dell'uva. Osservazioni ed esperimenti compiuti nell'Alto Canavese.** [The Vine Moths. Observations and experiments in the Alto Canavese region.]—*Consigliere dell' Agricoltore, Turin*, ii, no. 6, June 1914, pp. 190-194.

Satisfactory results were attained in the control of *Clysia ambiguella* and *Polychrosis botrana* with ordinary Bordeaux mixture to which from 1½ to 2 per cent. of tobacco extract had been added. Spraying against the first generation was carried out between the 25th May and the 2nd June, and against the second between the 16th and 20th July. In a vineyard at Ivrea, 8·57 per cent. of treated grapes and 53·66 per cent. of untreated ones were injured, the other conditions being equal. At Palazzo, the figures were 17·6 and 34·1 respectively in one vineyard and 8 and 16 in another. In many other cases the improvement was clearly visible though exact figures were not ascertained. Neither leaves nor grapes were scorched, except in one instance where an overdose of nicotin had been used, nor was the flavour of grapes or wine affected. Spraying must be carried out at the proper time and nicotin is always preferable to arsenicals, which should never be used after mid-July. It is not considered advisable to thin the foliage [see this *Review*, Ser. A, ii, p. 557], as this retards ripening; it is better to push the leaves aside when spraying. Shelter traps and other methods of capture are a necessary complement to spraying. Shelter traps of black, white, and coloured rags tied round the stocks were sometimes found to contain as many as 30 pupae when removed in November. Dark-coloured rags are preferred by the larvae. Cultural methods, such as the substitution of masonry and wire for the wooden vine-stakes, offer notable advantages, as regards both these and other pests.

SEVASTIANOV (I.). **Горе жителей Исфаринской долины.** [The calamity of the inhabitants of the valley of Isfara.]— **« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent*, no. 6, June, 1914, pp. 530–555, 13 figs.

In the course of a lecture delivered before the Turkestan Agricultural Society, the insect pests which for the last few years have played havoc with the orchards in the valley of Isfara, in the province of Fergana, are dealt with. Fruit-growing forms the chief occupation of the inhabitants of this valley, which annually exports from eight to sixteen thousand tons of dried peaches. During the last two years various insect pests, principally *Cosmia subtilis*, Stgr., and *Biston cinerarius*, Esch., and, to a less extent, *Rhynchites auratus*, Scop., and *Coleophora fabriciella*, Vill., have reduced the yearly output of many orchards by nearly 90 per cent. The caterpillars of *B. cinerarius* injure the petals and sepals of the blossoms and gnaw the outer and more developed leaves of the leaf buds, while those of *C. subtilis* attack the unfolded blossoms, devouring the stamens, ovaries, etc., but leaving the petals and sepals entangled in their web, which is thought to protect

them from the attacks of Tachinids and other parasites with short ovipositors. Both these caterpillars are figured and described. In March and April some of the larvae of *R. auratus* were found in the earth, showing that some of them do not winter in the pupal stage. This pest injures the ovaries of peach trees, and appears to have been recognised as a pest in Turkestan for a very long time, and an old legend is quoted according to which a former Khan of Turkestan ordered the digging out and the destruction of the pupae of this insect. The minute cases of the caterpillars of *Coleophora fabriciella* cover the young buds on which the caterpillars feed. They hibernate in the deep cracks in the bark of the large peach trees in great numbers. At the blooming period peach and other fruit-trees are also attacked by *Eulecanium* (*Physokermes*) *coryli*, L., *E. bituberculatum*, Targ., *E. pyri*, Schr., *Diaspis fallax*, Franc. & Kruger, *Epidiaspis piricola*, Del Guercio, and allied species. Early in May the caterpillars of *Biston cinerarius* pupate in the ground around the trunks, mostly at a depth of 2½ inches and at a distance of about 7 inches from them ; no pupae were found at a distance of more than 4 or 5 feet from the trunk or deeper than 5 inches. The imagines appear early in spring ; in the laboratory, wingless females emerged in 1913 at the end of February.

A similar defoliation of pear trees in Tashkent has been observed, which is caused by *Polydrosus obliquatus*, Faust, and *P. ferganensis*, Faust, the latter weevil appearing more frequently on apples and stone-fruits. Digging operations showed that pupae of *C. subtilis* were not found very near the trunks of trees, but occurred at a distance of 3½ ft. from the trunk, near the surface, in earthen cocoons, and it is thought that hard soil with cracks in it, covered with grass, is essential for the pupation of this species. Therefore in Fergana, where the peasants dig the ground round the trees, dressing it with clay and sand, the pupae are found only at some distance from the trees, while in Chodzhent in the province of Samarkand, where the soil round peach trees is not cultivated in this way, the pupae, according to the investigations of T. V. Nikitin in 1914, lie close together at the foot of the trunks ; as many as 45 pupae have been found in half a square foot. The moths emerge in from 10 to 20 days after pupation, being on the wing during the second half of May and the first half of June. They oviposit on the smaller branches, in which position the eggs remain over the winter. They are laid not only on peach branches, but also on those of pears, quinces and mulberries.

The caterpillars of another Geometrid, not yet identified, have been found attacking mulberry trees in 1914 in the valley of Isfara. In the first half of May, when the caterpillars of both *C. subtilis* and *B. cinerarius* had already pupated, vast numbers of these caterpillars were still defoliating the trees. The same pest also occurs in great numbers in the district of Chodzhent (province of Samarkand), where the cultivation of mulberries is very important and where their destruction threatens the local silk industry. There this pest also attacks peach, apple, quince, nut and cherry trees ; they have only slightly injured apricot trees and do not touch poplars and willows, but destroy the foliage of lucerne which has often been already half-eaten by *Hypera* (*Phytonomus*) *variabilis*, Hbst.

Very few parasites are found in Isfara and only a few larvae of an as yet unidentified Tachinid have been reared from some 1,000 pupae of *B. cinerarius* and *C. subtilis.* In the neighbouring district of Tcharku, on the contrary, these parasites are numerous, and it is thought probable that their abundance in Tcharku is due to the presence of the caterpillars of *Lymantria dispar*, which appear later than those of the peach-pests and thus provide a means for the development of a second generation of Tachinids.

In discussing remedies against all these pests, the local difficulties experienced, owing to the ignorance and suspicion of the natives, are enlarged upon. The remedies recommended include :—Sticky belts against *Rhynchites auratus*, which must be frequently renewed as they soon become dry from the heat ; owing to the rough surface of the trunk of peach trees in Isfara, the sticky material cannot be smeared directly on them, but on strips of paper placed on the tree, after the cracks, etc., have been filled with clay ; the digging out and destruction of the pupae of the GEOMETRIDAE, which can be done during the whole summer and winter, and of those of *C. subtilis*, which must be done in May ; spraying with Paris green and djipsin.

NOEL (P.). **La Teigne des Haies** (*Hyponomeuta cognatella*) **et la Teigne des Pommier** (*Hyponomeuta malinella*). [The Hedge Ermine Moth (*Hyponomeuta cognatellus*) and the Apple Ermine Moth (*Hyponomeuta malinellus*).]—*Jardinage, Versailles*, iv, no. 29, June 1914, pp. 363–365.

Thorn hedges in the Seine-Inférieure have been stripped by *Hyponomeuta cognatellus*, except those of the Laboratoire d'Entomologie agricole, where the author adopted the simple procedure of pruning after the 10th or 15th August and carefully burning the débris. *H. cognatellus* usually oviposits on the terminal leaves of the longer twigs, and pruning in June would chiefly remove these twigs, thus causing the moth to oviposit inside the hedge. If, however, the work is done at the time indicated, all the eggs will be destroyed. Pruning must therefore be done after the 15th August and in February, before new growth begins. Large quantities of *Hyponomeuta* pupae were collected and kept under glass bell-jars. Many hundreds of Ichneumons hatched out between the 7th and 11th July and by simply lifting the bell-jars once daily these were set free.

*Hyponomeuta malinellus* was controlled by spraying with a solution of copper arsenite or Scheele's green made up by mixing together $3\frac{1}{2}$ oz. of the copper salt and 35 oz. of wheat flour with a little water, the flour helping to keep the copper in suspension in the solution; this paste is then dissolved in 22 gallons of water. Apple-trees sprayed with the solution remained in perfect condition, whilst non-treated trees near by were seriously attacked. An increase of the copper from $3\frac{1}{2}$ oz. to $8\frac{3}{4}$ oz. led to slight injury to the trees. Spraying must be effected early in June, as soon as the caterpillars hatch and before they have time to do much damage.

NOEL (P.). **Comment on fait une Collection d'Insectes.** [How to collect insects.]—*Jardinage, Versailles*, iv, no. 29, June 1914, p. 376.

A reflector, used for collecting insects, is described, consisting of a

tin cowl resembling a shallow tobacco pipe, the bowl of which has a diameter of 40 inches and a depth of 30 inches. The short, broad conical stem extends about 30 inches from the bowl and its end is fitted into a wide-mouthed jar 12 inches high. In this jar a test tube filled with cotton wool saturated with chloroform is suspended. A concave mirror of silvered glass, 16 inches in diameter, is attached to the bottom of the bowl, with an ordinary paraffin lamp in front of it, the top of the lamp chimney being covered with wire gauze. The insects which enter strike the mirror and fall into the jar. A trap used in the Hérault vineyards consists of an open barrel laid on its side on 4 posts in the ground. A lamp stands on a brick inside the barrel, the bung-hole of which is over the chimney and thus carries off the fumes. The inside of the barrel is smeared with molasses.

**Destrucción del bicho de cesto. Empleo de un nuevo método.** [A new method of controlling Bag-worms.]—*Gaceta Rural, Buenos Aires,* vii, no. 83, June 1914, p. 889.

The Argentine Department of Agriculture has obtained from South Africa some tubes of the fungus, *Isaria psychidis,* and by propagation abundant material is now ready for use in spring against the Argentine Bag-worm, *Oeceticus platensis,* Berg. The best culture-medium is the potato, with or without glycerine.

**Larvas que perjudican las siembras.** [Larvae injuring sown seed.]—*Gaceta Rural, Buenos Aires,* vii, no. 83, June 1914, p. 935.

The destruction of the larvae of *Agriotes* (*Elater*) *segetis,* which is said to do serious damage in loose soils in the Argentine, by means o carbon bisulphide injections, is the most effective method, but is too costly in the case of cereal crops. As the attack usually takes place in spring, sowing should be done in the autumn. Birds and the ichneumon, *Bracon dispar,* provide a natural check on what would otherwise be a most injurious pest.

Pospielov (Th.). **Краткій обзоръ сельскаго хозяйства въ Катта-Курганскомъ уѣздѣ за 1913 годъ.** [A short review of the state of agriculture in the district of Katta-Kurgan in 1913.]—**« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent,* no. 6, June 1914, pp. 560–569.

It is mentioned that *Cydia* (*Carpocapsa*) *pomonella* and *Cydia* (*Grapholitha*) *funebrana* are firmly established in this district of Turkestan and that the crops from apple and plum trees are seriously depreciated by them.

Theodorov (K.) & Kostelov (S.). **Обслѣдованіе виноградниковъ въ 1914 г. въ Ташкентскомъ уѣздѣ.** [The examination of vineyards in the Tashkent district in 1914.]— **« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent,* no. 6, June 1914, pp. 603–604.

In an examination of 700 vineyards, undertaken by the Board of Agriculture to assist and educate the population, only 66 were free from diseases and pests; most of the vineyards suffered from

fungus diseases, while 58 were infested by *Eriophyes* (*Phytoptus*) *vitis* and three by other pests.

P. S. **Появленіе непарнаго шелкопряда.** [The appearance of *Lymantria dispar* in Turkestan.]—**« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent*, no. 6, June 1914, pp. 605–606.

Caterpillars of *Lymantria dispar* have appeared in great numbers in the Yamskaja rural district of Dzhisak. Previous outbreaks of these pests have always occurred for one summer only, after which they disappeared for a few years; usually great quantities of pupae, infested with parasites, were found everywhere on the hedges near the orchards.

Hewitt (T. R.). **The Larva and Puparium of the Frit-fly.**—*Scient. Proc. R. Dublin Soc., Dublin*, xiv, no. 23, June 1914, pp. 313–316. 1 pl. [Received 9th November 1914.]

A detailed description of the early stages of the frit-fly, *Oscinis frit*, L., one of the worst cereal pests in Europe, is given; it is common in Great Britain, and in recent years has been reported as doing considerable damage to cereals in several counties in Ireland.

Northrup (Z.). **A bacterial Disease of the Larvae of the June Beetles, *Lachnosterna* spp.**—*Centbl. f. Bakt. Parasit. u. Infekt., Jena*, xli, nos. 11–17, 30th June 1914, pp. 321–339, 4 pls., 5 figs.

The ravages of "white grubs," the larvae of the May or June beetles, *Lachnosterna* spp., were serious in the U.S.A. during the summer of 1912. It would appear that these were among the earliest recorded insect pests in the United States, having been known for upwards of 250 years, and there is a more or less regular recurrence of their activity every few years. The larvae feed upon the roots of many plants, cutting them off 2 inches or more below the surface and destroying a great variety of crops. One of these insects is a serious pest of sugar-cane in Porto Rico, being chiefly destructive in the 2nd and 3rd years of larval life. No satisfactory artificial methods of control have yet been devised in the United States, but this paper is intended to draw attention to the possibility of using fungus and bacterial parasites for this purpose. The appearance of *Lachnosterna* larvae attacked by the fungus disease is described. Microscopic observation showed that a *Micrococcus* was present in large numbers in infected individuals, and from observations upon the isolated *Micrococcus* it is concluded that this organism must exist in the soil, and that the diseased larvae must have become infected through some surface injury. Experiments on the infection of soils showed that excessive moisture in the soil greatly favours the spread of the *Micrococcus*. Larvae of the genus *Allorrhina* were found experimentally to be more resistant than those of *Lachnosterna*, though the younger the larvae, the less the power of resistance.

The common cockroach, *Periplaneta americana*, was also found to be attacked by the *Micrococcus*, but the infection apparently limited itself to the legs. Attempts to isolate the parasite from naturally

infected soil failed, but it was found not to lose its pathogenicity after existing over a year under artificial cultivation. It is concluded that there is much to be hoped for in the use of this organism in combating these very serious pests in the U.S.A. and the West Indies. The paper concludes with a list of 29 works referred to.

Zweigelt (F.). **Die Maikäfer in der Bukowina und die äusseren Bedingungen für ihre Verbreitung in Mitteleuropa.** [Cockchafers in Bukovina and the external conditions for their distribution in Central Europe.]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart,* xii, nos. 6–7, June–July 1914, pp. 265–291, 329–344, 3 sketch maps.

Both *Melolontha hippocastani* and *M. melolontha* occur in Bukovina, the latter species predominating in about one-quarter of the province in the north-east, especially in the Czernowitz district. *M. hippocastani* prevails in an area of about equal extent lying between the one mentioned above and the south-western half of Bukovina, which is uninfested. This species appears about the end of April, while *M. melolontha* only appears in May, and towards the end of that month in the colder regions. Even in the warmest localities these beetles occur later than in Lower Austria. Observations made both there and in Bukovina show that *M. melolontha* is more plentiful in the warm hill-lands and plains, whilst *M. hippocastani* prevails on the hills on account of its greater resistance to unfavourable climatic influences, though where the latter are very marked it loses its economic importance. Though very abundant, only one beech was found to be injured to every four oaks and six willows. Poplars, horse-chestnuts, alders, maples and lime-trees were also attacked. Stone-fruit suffered considerably, the German plum, cherry and walnut being most injured. Apples were little attacked and pears still less. Amongst field crops, potatoes, maize, clover, sugar- and fodder-beets were attacked by the larvae, especially the first-named. No damage to vines is reported, probably owing to the restricted vine cultivation. The severity and extent of the attacks of both larvae and adults is generally independent of the predominance of a given field-crop, though certain favourite food-plants exist. Control of the larvae was limited to collection during ploughing, whilst in some instances poultry were allowed to follow the plough. The practice of using pigs for this work should be abandoned, owing to the danger of parasitic intestinal infestation [see this *Review*, Ser. A, ii, p. 122]. To destroy the adults when caught, carbon bisulphide is recommended at a dose of 3½ oz. per 4 cubic feet of space filled with beetles, to be applied for 12 hours at least. Roughly 2½ million beetles were caught in 1912 in Bukovina, while in Lower Austria 600 times as many were captured in the same period, one reason for the difference being the lack of organised control in Bukovina.

Climate plays a most important rôle in the distribution of cockchafers, and the insects only become a pest in regions where high average annual temperatures prevail, together with the consequent scanty precipitation. Where the soil is dry, warm, deep and rich in food material the conditions are most favourable to these insects. The paper concludes with a bibliography of nine works.

**Koolziekten.** [Diseases of Cabbages].—*Inst. voor Phytopath., Wageningen, Vlugschr.* no. 10, June 1914, 4 pp., 1 fig.

The most important pest of cabbages dealt with in this leaflet is *Chortophila* (*Anthomyia*) *brassicae*. It appears early in the spring, the eggs being laid on the stems of the cabbages close to the surface of the soil. The larvae eat their way into the stalks and bore downwards. The flies emerge in June, and in the course of the summer there appears to be a third generation which winters as pupae in places where cabbages are stored or in the soil itself. The pest must be attacked on the young cabbage plants before they are planted out, the stems being freed from the eggs and a flat, tarred paper collar placed round them, parallel with but not touching the soil.

**Eenige Rhododendron-vijanden.** [Some Rhododendron Pests.]—*Inst. voor Phytopath., Wageningen, Vlugschr.* no. 11, June 1914, 4 pp.

The bug, *Tingis rhododendri*, has probably been imported into Holland with rhododendrons from abroad, possibly from Japan, and has caused very considerable damage in rhododendron nurseries. The eggs are laid on the underside of the leaf, generally along the principal veins, and a small swelling marks the point of deposit of each egg. The bugs suck the juices of the leaves and the punctures made on the underside of the leaf show themselves on the upper side as a fine stippling. All varieties of rhododendrons are said to be attacked and also *Andromeda japonica* and *Kalmia latifolia*. Nothing can be done against the pest in the winter, as the eggs are then within the leaf and cannot be reached. The best plan is to attack the young bugs with contact poisons as soon as they emerge. Fish-oil soap ($\frac{1}{2}$ to 1 lb. in 3 gals. water) has proved particularly useful. Another useful spray is a solution of soap in spirit; 2 gallons of soft soap, $\frac{1}{2}$ to 1 gallon of crude spirit and 100 gallons of water, with or without the addition of tobacco extract. Care should be taken to spray the undersides of the leaves thoroughly and the spraying should be repeated in a few weeks.

*Otiorrhynchus sulcatus* attacks both rhododendrons and yew, the leaves and buds of which it eats in a characteristic manner. These weevils can be caught by laying tufts of wood wool or small pieces of board between the plants. These should be examined early in the morning and the beetles which have collected in or under them should be destroyed. A solution of 1 ounce of Paris green and 2 lb. of lime in 19 gallons of water is useful against this and similar pests.

**Eeniger belangrijke rozenvijanden.** [Some important pests of roses.]—*Inst. voor Phytopath., Wageningen, Vlugschr.* no. 12, June 1914, 6 pp.

The sawfly, *Eriocampoides aethiops*, does great damage in Dutch rose gardens. Spraying with a 10 per cent. solution of Paris green or a $\frac{1}{2}$ per cent. solution of lead arsenate is of some value. Dusting with American insect powder by means of bellows is also a very good method of combating the pest. The same treatment should be used against *Hylotoma rosae*. The eggs of another sawfly,

*Blennocampa pusilla*, are laid in May on the leaves, which the larvae cause to roll up so tightly that spraying is useless, and the hand-picking of the rolled leaves and burning them is all that can be done. This should be attended to as soon as any sign of attack manifests itself, otherwise the larvae will mature and drop to the ground to pupate. Against the Aphids, *Siphonophora rosae* and *S. rosarum*, a spray prepared with 4½ lb. soft soap and 1½ pints crude spirit in 19 gallons of water is recommended. For roses grown under glass the quantities of soap and spirit may be reduced to half. Against *Tetranychus telarius*, a winter dressing with 6 per cent. carbolineum is recommended. Another good plan is to dust the plants with sulphur or to spray with Californian mixture [see this *Review*, Ser. A, ii, pp. 209–210], 1 part in 35 parts of water. *Typhlocyba rosae*, both as nymph and perfect insect, attacks the underside of the leaves, especially along the principal veins, and if numerous, does great damage. As the eggs are laid on the ends of the branches, a dressing of 6 per cent. carbolineum may be useful as a remedy, and this should be applied as soon as the first white spots are seen on the leaves, as this indicates the presence of the insect.

**De kleine wintervlinder.** [The small winter moth, *Cheimatobia brumata*.]—*Inst. voor Phytopath., Wageningen, Vlugschr.* no. 14, June 1914, 3 pp.

*C. brumata* is a very widespread pest in Holland in orchards, nurseries and forests, and the damage done is very considerable. One of the most practical remedies consists in the use of sticky bands upon the trees, and these must be attached to the trees in such a way that the caterpillars cannot creep up between the paper and the bark. The band should be placed about 3 feet above the soil, or higher if cattle are grazed in the orchard. It is also well to place bands on 3 or 4 of the larger branches, and if the infestation be very serious, two bands on each trunk. Shade trees, elms, willows, etc., in the hedges round the orchard should also be banded. Bush fruit which cannot be banded may be sprayed with 1 ounce of Paris green and 1–2 lb. of lime in 19 gallons of water, or with 1 lb. of lead arsenate in the same quantity of water. Spraying with these poisonous substances should not be done within 5 weeks of the time at which the fruit is likely to be gathered.

The operations against *Cheimatobia brumata* also apply to *Hybernia* (*Fidonia*) *defoliaria* and *Anisopteryx aescularia*. The latter generally makes its appearance at the end of winter or very early in spring.

Baer (W.). **Ueber den Frass von *Janus luteipes*, Lep., in Weidenruten.** [The damage done by *Janus luteipes*, Lep., in Osiers.]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart*, xii, no. 6, June 1914, pp. 292–294.

The sawfly, *Cephus pygmaeus*, is a well-known cereal pest, though allied species are not of sufficiently frequent occurrence to be feared as yet. The larvae of many species attack young rose shoots. Two North American species of the allied genus *Janus* attack currants and osiers in this manner, whilst *Janus cynosbati*, L., lives in the tips of

oak-twigs and *J. compressus*, F., infests pear trees. *J. luteipes*, Lep., seriously damages osiers in the Tharandt district. The attack begins to be visible in September, and its effects are complete by the end of October. Osiers about a yard long and from one-fifth to two-fifths of an inch in diameter near the base, wither from 12 to 20 inches and the bark turns brown or blackish. The tip is held together by the bark alone, the tissues beneath being reduced to powder. As the injury extends to the thicker portion, it is confined to the medullary tube, generally ending in a spiral of one or two turns, indicated by a raised mark in the bark. The osier rods often snap or bend at these points. The damage resembles that done by the larvae of *Oberea linearis*, L., and also by *Coraebus fasciatus*, Vill., and *Sinoxylon perforans*, Schrk. When full grown, the larva returns an inch or so up its gallery and hibernates there, pupating in a cocoon in a chamber at the side. References to the few publications dealing with this species are given.

RUTHERFORD (A.). **Report of the Entomologist.**—*Rept. Ceylon Dept. Agric. from July 1, 1912 to December 31, 1913, Colombo*, 1914, pp. 9–12. [Received 6th September 1914.]

Among the pests of tea included in this report are *Xyleborus fornicatus*, and *X. compactus* [see this *Review*, Ser. A, ii, pp. 305–306 and p. 323]. The bark-eating borer* has been more prominent than usual, living in a short gallery in the stem, which forms a centre of decay and permits the access of termites to the tissues; the caterpillar itself does little harm directly, and may be dealt with as recommended for red-borer, *Zeuzera coffeae* [see this *Review*, Ser. A, ii, pp. 150–151]. *Heterusia cingala*, Moore, the red slug, and nettle-grubs have all been reported on tea [see this *Review*, Ser. A, ii, p. 654] and mites, especially *Tarsonemus translucens*, the yellow mite, have been common [see this *Review*, Ser. A, ii, pp. 151–152 and p. 306]. Nothing can be done against termite injury to tea except to destroy the nests [see this *Review*, Ser A, ii, pp. 512–513]. Other insects reported from tea in the course of the year are bagworms, *Helopeltis antonii*, Sign., *Stauropus alternus*, Wlk (lobster caterpillar), *Capua coffearia*, (tea tortrix), *Saissetia* (*Lecanium*) *formicarii*, Gr., *Orgyia postica*, Wlk., and *Taragama dorsalis*, Wlk. *Capua coffearia* was said to be confined to acacia-planted fields, while the caterpillars of *Taragama dorsalis* had been feeding on dadap.

Pests of rubber [see this *Review*, Ser. A, ii, pp. 191–192] included the larvae of a Phorid fly which were feeding on the products of decomposition of an imperfectly cured block of rubber. The Pentatomid, *Cyclopelta siccifolia*, Westw., the chief food-plant of which is dadap, and the Capsid, *Helopeltis antonii*, Sign., were both reported on cacao, spraying the pods with kerosene emulsion when the bugs are young being recommended against the latter. *Rhynchophorus ferrugineus*, Ol. (red weevil) attacked coconut, but all the grubs were killed with carbon bisulphide; a Hesperid and a Microlepidopteron (probably

* Sir George Hampson considers that this is probably *Arbela minima*, Hmp., which is closely allied to the bark-borer of tea in Assam, *A. theivora*, Hmp.—ED.

*Nephantis serinopa*, Meyr.) were also among the coconut pests. From rice infested with HESPERIIDAE (probably *Parnara colaca*, Moore, and *P. mathias*, F.) two Tachinids were reared; arsenate of lead (4 lb. in 100 gals. water) should be used against the caterpillars. *Saissetia nigra*, Nietn. (black scale) against which kerosene emulsion spray is recommended, and the Lygaeid bug, *Oxycarenus laetus*, Kby., were pests of cotton, while the only citrus pests were *Apogonia comosa*, Karsch, and a mite (probably *Tetranychus mytilaspidis*, Riley). Various other insects of economic importance include: fruit-fly (*Dacus cucurbitae*, Coq.) and a Chrysomelid (*Aulacophora* sp.) injuring snake-gourd; the weevil, *Odoiporus longicollis*, Oliv., in the rhizomes of diseased plantains; *Agromyza phaseoli*, Coq., on beans; the caterpillars of *Tetrastia meticulosalis*, Guen., in twigs of dadap and red toona; the ant, *Dorylus orientalis*, Westw., attacking kohl-rabi; *Saissetia nigra*, Nietn., and *Pulvinaria* sp. (probably *burkilli*, Gr.) on *Croton tiglium*; the weevil, *Sipalus hypocrita*, Boh., in rubber attacked by canker; caterpillars of *Orgyia postica*, Wlk., defoliating dadap; *Icerya* sp., and *Lepidosaphes gloverii*, Pack., on variegated croton; the Locustid, *Aularches miliaris*, F., feeding on *Elucine coracana*; *Euproctis scintillans*, Wlk., defoliating *Acacia decurrens*; *Tachardia albizziae*, Gr., and *Pulviniaria* sp. on *Nephelium litchi*; *Popillia discalis*, Walk., defoliating roses; *Coccus viridis*, Gr., on coffee; the aphid *Ceylonica theaecola*, Buckt., on tea, cacao, and *Ixora coccinea*; *Oscinis theae*, Bigot, the tea leaf-miner; *Heortia vitessoides*, Moore, defoliating *Lagetta lintearia*; larvae of *Cryptoblabes proleucella*, Hmp., feeding on *Coccus viridis*, Gr.; *Caprinia conchylalis*, Guen., defoliating *Funtumia elastica*; *Pericallia* (*Arctia*) *ricini*, F., defoliating beans; *Pseudococcus* sp. on indigo; and *Coccus viridis*, Gr., and *Ischnaspis longirostris*, Sign., on *Landolphia kirkii*.

LECAILLON. **Sur la Reproduction et la Fécondité de la Galéruque de l'Orme** (*Galerucella luteola*, **F.**) [On the Reproduction and Fecundity of the Galeruca of the Elm (*Galerucella luteola*, F.).]—*C. R. Acad. Sci., Paris*, clix, no. 1, 6th July 1914, pp. 116–119.

The Chrysomelid beetle, *Galerucella luteola*, F., is distributed throughout Europe, Algeria and the United States. Both larva and adult attack the foliage of the common elm, *Ulmus campestris*, and often do considerable damage. Observations made in the neighbourhood of Toulouse, show that in that region the period of reproduction begins in May and lasts until the beginning of July, females in captivity laying as many as 500 eggs. In nature the eggs are laid a few at a time on separate leaves and often on different trees.

SURFACE (H. A.). **For Striped Cucumber Beetles.**—*Wkly. Zool. Press. Bull., Penns. Dept. Agric., Harrisburg*, no. 271, 6th July 1914.

*Diabrotica vittata* feeds in the early spring on the leaves, stems or roots of the cucumber, and other cucurbitaceous plants, laying its eggs at the roots of the young plants. The small white larvae remain through the winter in the soil, where they pupate. Where the infestation is limited, the plants should be dusted with a mixture of equal parts of pyrethrum, hellebore, tobacco dust, sulphur, and

either arsenate of lead or Paris green; but where it is more extensive, they should be sprayed with one ounce of arsenate of lead in each gallon of water, in either case just after the leaves appear above ground. A little of the dust mixture worked into the soil is often beneficial. Another successful method consists of putting a mixture of turpentine and lime at the base of the plants and covering these with mosquito netting. If the ground round the plants is hard, the larvae will be killed by exposure to the sun's rays.

Brunner (J.). **The Sequoia Pitch Moth, a Menace to Pine in Western Montana.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 111, 11th July 1914, 11 pp., 5 figs.

Between the Swan and Clearwater Rivers in Montana, the sequoia pitch moth (*Vespamima sequoia*, Edw.) is a very serious factor in forest destruction over 90,000 acres of forest. *V. sequoia* has practically no natural enemies, but *Dendroctonus monticolae*, the mountain pine beetle, frequently attacks and kills trees infested by the larvae of *V. sequioa*, which cannot survive without the flow of sap. Outdoor and laboratory observations on *V. sequoia* show that the flight of the mature insects and oviposition occur between 25th June and 15th July, and that both are over by 1st August. The adult is rather short-lived, the female dying, unless fertilised, within three days after emergence. Few eggs are deposited in any one place and it was observed that wherever two larvae were too close together, one invariably died. The length of the incubation period is unknown, but injury by young larvae was noticed by 15th August. About 1st October, when frost arrests their activity, the larvae, especially the females, have attained considerable size. The following summer is spent in the tunnel in the pitch exudation, and the pupal stage occupies 30 days, the adults emerging two years after the egg was laid. Large flights are to be expected during 1914, 1916, 1918, etc., unless the insect is controlled, and smaller ones during 1915, 1917, 1919, etc. The insect prefers sunny openings within the forest, slopes where the soil is rather sandy, and ridges along watercourses. Although it attacks all kinds of conifers, lodge pole pine and yellow pine seem to suffer most. Infested trees are readily located by the pitch exudation over the tunnel of the larva. The trees are attacked at the extreme base and the exuding pitch often flows out from the tree 10 or 12 inches over the ground. The larva begins its mine in a crevice of the bark, where the egg was deposited, and constructs transverse galleries running in both directions from the point of entry and widens this tunnel at the centre to produce a chamber. In small trees the mine is always nearly straight across the grain of the wood. Entire girdling only occurs with plural infestation, which is a very rare occurrence, as the larva instinctively avoids destroying its own food supply by killing the tree.

Surface fires leave moth-infested trees weak and wounded, as the pitch exudation burns readily. The only way to reduce the numbers of *V. sequoia* appears to be the destruction of the larvae by hand. The cost of this might be reduced by the collection and shipment of the pitch, since analysis of these resins, received from the U.S. Bureau of Chemistry, support the view that no difficulty would be encountered in disposing of the turpentine produced from the exudations.

d'Herculais (J. K.). **Corrélation entre la Mortalité des Ailanthes (*Ailanthus glandulosa*, Desf.) et la Disparition du Bombycid (*Samia cynthia*, Drury), son Hôte.** [Correlation between the mortality of Ailanthus (*Ailanthus glandulosa*, Desf.) and the disappearance of the Bombycid (*Samia cynthia*) dependent on it.]—*C. R. Acad. Sci., Paris,* clix, no. 2, 13th July 1914, pp. 210–212.

*Ailanthus glandulosa*, which was introduced into Europe from China two hundred years ago as a suitable food-plant for silkworms, is apparently dying out in France, owing to a disease which produces large excrescences on the roots. The mortality amongst these trees reacts on the caterpillars of *Attacus* (*Samia*) *cynthia* which feed on them and accounts for the present rarity of these insects.

Urich (F. W.). **Entomologist's Report.**—*Minutes of the Meeting of the Trinidad Bd. Agric.*, no. 6, 17th July 1914, p. 33.

The first sign of froghoppers, consisting of adults and nymphs, was observed on 2nd June. Fields were sprayed with spores of the green muscardine fungus on 30th June, and on 14th July dead froghoppers were collected on which the fungus was growing. Fields burnt by accident showed very few nymphs as compared with the unburnt parts; this was no doubt due to the eggs having been deposited mostly in the trash instead of in the ground. In a field where the vermilion egg-parasite was established last year, there have been very few nymphs observed when the rains set in. The small moth borer, *Diatraea*, had been doing some damage to sugar-cane and numerous trap lights should be used for catching the moths, and the caterpillars should be cut out. Cacao beetles and worms were still being caught in some parts of the Island, but they were not as numerous as during the dry season. Caterpillars and leaf-eating beetles were more in evidence, but no serious outbreak had been reported. In some localities where the coconut scale, *Aspidiotus destructor*, had obtained a good footing during the dry season, numerous small predaceous beetles have been devouring the scales. In cases where spraying against the scale has to be practised, lime-sulphur should be used.

**Destruction de la "Fourmi manioc" par l'anhydride sulfureux liquéfié** [Destruction of manioc ants by means of liquid sulphurous anhydride.]—*Revue Scient., Paris,* 18th July 1914, pp. 83–84.

The manioc ant (*Atta sexdens*, L.) is one of the most troublesome insect pests in Guiana, and was the cause of great loss to the French colony in 1913–1914. To combat the insects, the practice has been to treat the ant-hills with insecticides such as carbon bisulphide. According to Dr. G. Devez, liquid sulphurous anhydride is an efficient insecticide for this purpose. The liquified gas is carried to the ant hill in steel vessels, which are provided with a length of flexible bronze tubing 74 centimetres long terminating in a copper nozzle. This is pierced with holes at its extremity to allow the emission of the gas, which is forced into the different openings of the ant-hill; 8 lb. of liquid anhydride is sufficient to destroy a large colony.

Brunner (N.). **Яблоневая моль и яблочная плодожорка** [*Hyponomeuta malinellus*, Zell., and *Cydia* (*Carpocapsa*) *pomonella*, Z.]—**«Прогрессивное Садоводство и Огородничество.»** [*Progressive Fruit-Growing and Market-Gardening*], *Petrograd*, no. 27, 19th July, pp. 870–872; no. 28, 26th July, pp. 887–888; and no. 31, 16th August 1914, pp. 951–955. 1 fig.

This is a general account of these two pests in orchards of various districts of the government of Ekaterinoslav. The remedies recommended against *Hyponomeuta malinellus* consist of destruction of the eggs and the pupae by cleaning the trees in autumn from the "shields" containing the eggs, the removal of the nests, and spraying with insecticides against the caterpillars. The destruction of the nests must be done late in spring, when the caterpillars have already pupated, otherwise they may be able to escape. A long-armed pruning tool ("secateur"), by means of which the removal of the nests can be performed, is figured. The following recipes for insecticides are given: (1) 9 oz. of Paris green in about 44 gallons of water is mixed with the same amount of water in which 15 oz. of freshly slacked lime has been dissolved, the latter solution having been previously filtered; about ½ lb. of molasses may be added for adhesive purposes. (2) A solution of barium chloride, 1½ lb. to the gallon of water. The cost of both these insecticides is about the same, being about £1 per acre, containing 260 trees, allowing about 5½ gallons for each tree. One spraying must be done immediately after the unfolding of the leaves and another one after the blossoming.

As remedies against *C. pomonella*, spraying, trap belts, and the destruction of fallen fruits are recommended. Against the first generation, the spraying must be done twice in spring, the first coinciding with the second spraying against *Hyponomeuta malinellus*, thus effecting a saving in cost, and the next a week later. In South Russia, another spraying must be done when the second generation appears. Spraying with djipsin is less satisfactory than with Paris green or barium chloride. Trap belts are best made from wood shavings. They must be put on the trees at the beginning of July, and while in South Russia they must be inspected and renewed every 5–7 days till no more caterpillars of the first generation appear, in North Russia, where only one yearly generation exists, they can be left on the tree, without any control, till October or later, when they must be removed and destroyed. In South Russia, trap belts are again necessary from the end of August against the second generation, and must be removed in October.

Vermorel (V.) & Dantony (E.). **Sur la Composition chimique des Bouillies bordelaises alcalines et sur le Cuivre soluble qu'elles renferment.** [On the chemical composition of alkaline Bordeaux mixtures and the soluble copper which they contain.]—*C. R. Acad. Sci., Paris*, clix, no. 3, 20th July 1914, pp. 266–268.

Experiments carried out by the authors on the chemical composition of Bordeaux mixture show that when an excess of lime is added to a solution of copper sulphate, either blue hydrates of copper or green basic sulphates of copper are obtained, according to whether

the lime is added slowly or quickly; if hydrates are formed they are always in the form of the stable hydrate of Péligot. Alkaline Bordeaux mixtures, contrary to general opinion, contain copper in a soluble state 2,000 to 4,000 times more concentrated than is necessary to stop the growth of mildew, and objections raised against Bordeaux mixture in respect of its content of soluble copper are unjustifiable.

SURFACE (H. A.). **The Apple Leaf-Hopper.**—*Wkly. Zool. Press Bull., Penns. Dept. Agric., Harrisburg,* no. 274, 27th July 1914.

Against *Empoasca mali,* one pound of whale-oil soap in five gallons of water, or one pound of common brown laundry soap in about three gallons of water, or kerosene emulsion not more than ten per cent. in strength, or strong tobacco decoction, are recommended. Advice is given as to how to apply the insecticides [see this *Review,* Ser. A, i, p. 183] and the importance of spraying before *E. mali* has developed its wings emphasised; if this has not been done, the trees should be thoroughly sprayed and a stronger dose of the insecticide applied directly to the soil.

**Общіе выводы объ ожидаемомъ уражаѣ хлѣбовъ и травъ къ 10-му іюля 1914 года.** [General estimates of the expected harvest of grain and grasses on the 23rd July 1914]—**« Извѣстія Главнаго Управленія Землеустройства и Земледѣлія.»** [*Bulletins of the Central Board of Land Administration and Agriculture*], *Petrograd,* no. 30, 30th July 1914, pp. 734–740.

This is an official review of the position of crops according to information received from 8,500 local correspondents of the Board and contains the following references to harmful insects. Various pests appeared in large numbers, but with rare exceptions no serious damage was done by them to crops. Species of *Phyllotreta* caused great damage to peas, vetches, lentils, linseed and hemp seed, also to beetroots, cabbage and turnips. On the same plants CURCULIONIDAE were reported from Tambov, Penza, Nijni Novgorod, Livland, Perm, and the Vistula. In Saratov, lentils, peas and mustard suffered from Aphids, which also occurred in the Vistula, Taurida and Tchernigov governments on vetches and in orchards. Elaterid larvae did damage in many places, especially to summer-sown crops in Livland and Saratov. *Anisoplia austriaca* has been specially injurious in Poltava, Taurida and Astrachan, but also occurred in Tambov, Tula, Voronezh, Bessarabia, Cherson, and in the province of the Don. Sawflies were reported from Tula, Orel, Taurida, Ekaterinoslav, Poltava, Saratov, and in the province of the Don, but did little damage. In Bessarabia and Cherson, oats and wheat suffered considerably from *Cecidomyia contractor,* which was less injurious in Orel, Voronezh, Kiev, Samara, and the Vistula. *Oscinis frit,* although it appeared in many places, did little harm. Thrips occurred only in Voronezh, Samara, Saratov, and in the province of the Don, damaging summer-sown wheat and rye. Species of *Lema* are reported in Bessarabia and in the province of the Don, and *Meligethes aeneus,* F., on rape seed in Bessarabia. Locusts were observed in Samara, Saratov, Perm, and Orenburg, where the outbreak was particularly threatening.

RUTHERFORD (A.). **Treatment of trees parasitised by Coccids.**—*L'Agron. Colon., Paris*, ii, no. 13, 31st July 1914, p. 24.

In a letter to the above periodical, a formula is given against injurious Coccids, such as *Coccus* (*Lecanium*) *viridis*, viz :—Resin 1 lb., commercial soda crystals 1 lb., soap 1 lb., in 4 gallons of water. The resin must be powdered as finely as possible, mixed with the soda with the help of a little water and the mixture is then gently boiled. Water is added from time to time and stirring is continued until a clear liquid is obtained. The soap is scraped into shavings and then added in small quantities to the boiling fluid, which is stirred until the soap is entirely dissolved. The solution is then taken off the fire and left to cool. After this it is diluted to its working strength and may then be used either as a spray or for brush application. The soda crystals may be replaced by half their weight of sodium carbonate monohydrate.

DYAR (H. G.). **A New Phycitid injurious to Pine.**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, no. 7, July 1914, p. 112.

A new Phycitid moth, injurious to pine trees, *Pinipestis erythropasa*, sp. n., is described. It may ultimately be placed in the genus *Dioryctria*.

*Heliothis armiger* **на помидорахъ и** *Thrips* **на хлопкѣ.** [*Chloridea obsoleta* on tomatoes and *Thrips* on cotton-seed.— **« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent*, no 7, July, 1914, p. 699.

Investigations at the Entomological Station of Turkestan have led to the discovery of large numbers of *Chloridea obsoleta* on tomatoes and of *Thrips* on cotton seed. The outbreak is thought to be due to the absence of rotation of crops in the local methods of agriculture, tomatoes being grown on the same ground for many years, while plantations under cotton are not changed for decades.

HINDS (W. E.) **Boll weevil effect upon cotton production,**—*Alabama Agric. Expt. Sta., Auburn*, Bull. no. 178, July, 1914, pp. 87–99, 1 map.

*Anthonomus grandis*, the boll weevil, has spread steadily since 1891, when it entered Texas from Mexico, at an average annual rate of 50 miles. This progress is due to the adaptability of the cotton-plant to a more northern climate than that in which it originated, but the degree of damage by the boll weevil will not be uniform throughout the cotton area, owing to the smaller number of generations in cooler and drier portions of the cotton belt; *e.g.*, in North Texas (33° N. lat.) there is one generation less than in South Texas (29° N. lat.). By far the most important factors in natural control are climatic conditions; extremes of heat and drought are most important when they occur at the beginning of the fruiting season and continue for six weeks or more, and the author instances the extermination of the weevil in West Texas and South Central Oklahoma during May and June, 1911. In some localities the temperature reached 116° F. in the shade,

and during the eight or ten weeks the total rainfall was less than 1½ inches. Extremes of cold and wet in winter have occasionally exterminated the weevil; this happened in Central Arkansas and Northern Mississippi in 1911–12, but in Alabama there is no likelihood of control by heat and drought, although in the mountainous regions in the north-east and north of the Tennessee valley, extreme winter temperature may check the advance of the weevil. The occasional reduction of the weevil by early frosts demonstrates the possibility of control by means of a general destruction of stalks in autumn; the general stripping of cotton by the cotton worm has much the same influence in checking multiplication of the weevil.

By studying the map, on which the rainfall and boll weevil injury zones are charted, it is possible to determine approximately what degree of damage may be anticipated as the boll weevil advances. This pest may be credited with a large portion of the rise in price of cotton between 1902, when it sold at 2½*d.* and 3*d.* per pound, and 1910, since when the price has ranged from 5*d.* to 7*d.* or more. Two tables are given showing the effect of this weevil upon the yield of cotton per acre, by five-year periods, in Texas, Louisiana, Mississippi, Arkansas, Alabama, Georgia, North and South Carolina, the first four being classed as infested, and the remaining four as uninfested States. In three half-infested States the decrease averaged 13·6 per cent., while in Louisiana (wholly infested) the figure was 38 per cent. The injury according to rainfall zones is also discussed. In Arizona [see this Review Ser. A. ii, p. 78], a variety of the boll weevil (*Anthonomus grandis* var. *thurberiae*) has been discovered on a plant closely allied to cotton, and being adapted to a dry climate, the periods of hot weather of Texas, should it by any chance be introduced into that State, would have no effect in controlling it and the weevil would there become a serious pest.

Ossipov (N.). **Опыты борьбы съ червецомъ сливы.** [Experiments on fighting *Lecanium cerasi.*]—**« Садоводъ »** [*The Fruit-Grower*], *Rostov-on-Don*, no. 7, July 1914, pp. 514–521.

Various experiments on the control of *Eulecanium* (*Lecanium*) *cerasi*, which have been conducted in 1912 and 1913 in the districts of Chotin and Kishinev of the Government of Bessarabia, are described. The damage done by this pest in this province is very great and increases yearly, whole orchards being destroyed. The female oviposits in the middle of summer and the larvae hatch the same year, spreading over the whole tree, living chiefly on the lower sides of the leaves, but the amount of damage done at this period is however not important. The larvae winter on the trunks and branches of trees or in fallen leaves, and early in spring attach themselves to the young branches; they develop rapidly, becoming mature in the second half of May and during this time seriously injure the trees.

A spraying experiment with carbolineum was started on 25th March 1912, in the district of Chotin. At that time the hibernated larvae were already swarming over the trees. One part of carbolineum was dissolved in six of water. Eighteen trees were sprayed and the immediate results were very favourable, and an examination in the first half of June showed that such individuals as survived consisted

of larvae which had reached the trees after the spraying. When this orchard was visited in March 1912 the general condition of the trees was very much improved, though some of the scale-insects remained. The cost of this remedy amounts to about 6d. per tree. Experiments with green soap and with iron sulphate were undertaken simultaneously in the district of Kishinev in November 1913. At this time many leaves still remained on the plum trees attacked by scale-insects, though not on other fruit trees, and many of the fallen leaves contained larvae of *E. cerasi.* Three solutions of green soap were prepared, containing respectively ½, 1 and 2 lb. of soap dissolved in about 2¾ gallons of water, while the strength of iron sulphate was 5 per cent. The examination of the sprayed trees had to be left till the following February, 1914, when branches from the sprayed trees were kept in the laboratory under artificial conditions. The larvae from the trees sprayed with 5 per cent. iron sulphate and with ½ and 1 lb. of green soap were unharmed, while those from the trees sprayed with 2 lb. of green soap perished. Thus only the latter solution can be recommended as efficient, its cost amounting to 2d. per tree. As this solution does not injure the swelled buds, a late spraying is advisable, for most of the larvae are then on the trees. An experiment with kerosene water by means of the newly invented "kerovator" of the system of "Platz" and the sprayer used are described. The sprayer is filled with water and is connected by means of a hose with the kerovator filled with kerosene and fixed to a belt. The percentage of the solution in the apparatus should be tested before use. The experiment was conducted on 9th March 1914, the strength of the solution varying from 1 per cent. to 21 per cent. As at the time of the experiment some larvae were still hibernating amongst the fallen leaves, trap belts were put on the trees so as to prevent these larvae from reaching them after the spraying. Examination of branches taken from the sprayed trees and kept in the laboratory showed that 1 per cent. and 2 per cent. of this solution were ineffective while all stronger solutions destroyed the larvae. On branches taken from trees without trap belts on them a small number of living larvae were found, irrespective of the strength of the solution applied, showing that they must have reached the tree after spraying. The cost of this remedy is only about 1¼d. per tree, allowing 5½ lb. of kerosene for 6 trees. Thus it is the cheapest and at the same time also the most handy remedy, as kerosene can be obtained everywhere, which is not always the case with carbolineum and green soap.

Rutherford (A.). **Leaf Miner of Citrus** (*Phyllocnistis citrella*, **Stainton**).—*Trop. Agric., Peradeniya*, xliii, no. 1, July 1914, pp. 49–50.

The larvae of the Tineid, *Phyllocnistis citrella*, attack citrus trees, mining the young twigs and leaves, and the folds thus induced may be subsequently tenanted by *Pseudococcus* spp., which in Ceylon, however, are attacked by the Lycaenid, *Spalgis epius*, West., and a Cecidomyiid, *Diadiplosis coccidivora*, Felt. The caterpillars of *P. citrella* are subject to the attack of small, black Chalcids, the larvae of which feed externally on them. These parasites do not appear to constitute an effective control and the citrus-grower should be on the look out for the first signs of attack, and spray with tobacco extract.

Citrus trees in Ceylon are also infested by a species of *Walkeriana*, which encrusts the stem and branches, but this scale is heavily parasitised by an Agromyzid, *Cryptochaetum curtipenne*, Knab, and a colony of *Walkeriana* was also observed to be nearly wiped out by the caterpillar of a Pyralid. Other pests of citrus in Ceylon include *Coccus viridis*, Green, *Lepidosaphes beckii*, Newm., *Apogonia comosa*, Karsch, and *Toxoptera* sp.

**Electricity for Destruction of Green Flies.**—*Botan. Jl., London*, iii, no. 2, July 1914, pp. 35–36.

A short note on the use of electricity for the destruction of APHIDIDAE states that the apparatus used consists of a small induction coil, run by dry cells and a small Leyden jar, a large resonator coil being connected up with it, as in a small wireless apparatus. The free end of the resonator coil is connected to a piece of flexible wire attached to an ebonite handle, by means of which the wire can be held near the rosebuds. The instant this is done sparks fly to the rosebud, and, when properly regulated, kill aphids and ants, the former remaining on the buds, the latter dropping off. Too strong a current bleaches the roses, and the present objection to this method lies in the fact that the time required to rid one plant of insects in this way would be about equal to that needed to spray 100 trees.

FROGGATT (W. W.). **A Descriptive Catalogue of the Scale-Insects (Coccidae) of Australia.**—*Agric. Gaz. of N.S.W., Sydney*, xxv, July 1914, pp. 599–610, 2 pls.

Additional Coccids in this catalogue [see this *Review*, Ser. A, ii, pp. 427–428] are :—*Parlatoria destructor*, Newst., from the apple ; *P. proteus*, Curt., from *Pinus insignis* and *Citrus* ; *P. pittospori*, Mask., from *Pittosporum undulatum* ; *P. viridis*, Full., from *Pittosporum* sp. ; *P. ziziphus*, Lucas, from *Zizyphus spinachristi* ; *Lepidosaphes* (*Mytilaspis*) *auriculata*, Green, from *Croton* ; *L. beckii*, Newm. (the " Purple Scale "), from *Croton* and *Citrus* ; and one new species, *L. eucalypti*, from *Eucalyptus piperita*.

HARDENBERG (B. B.). **The Aloe gall.**—*Agric. Jl. Union S. Africa, Pretoria*, viii, no. 1, July 1914, pp. 70–72, 1 fig.

Several species of aloe are subject to the attack of an undetermined mite of the family ERIOPHYIDAE, which causes galls on the leaves and flower-stems and which, when once established, spreads very quickly and may affect the whole plant in one season. On the flower-stems the galls may attain the size of a walnut, or even of a small orange. The mites swarm in countless numbers over the surface and in the crevices of the gall, and in May could be found in all stages of development from egg to adult ; they do not penetrate the tissues. The galls reach their greatest development in late autumn or winter, so that it is probable that the heavy rains of spring and summer are inimical to the development of the mite. The galls have been observed principally on *Aloe transvaalensis*, Kuntze, but other species are also attacked.

Faure (J. C.). **An interesting larval habit of the pepper-tree caterpillar** (*Bombycomorpha bifascia*, **Walk.**).—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 1, July 1914, pp. 75–76.

The migratory habits of the full-grown larvae of *Bombycomorpha bifascia*, the pepper-tree caterpillar [see this *Review*, Ser. A, i, p. 12] just before pupation are very marked. About the middle of April many second-brood larvae were seen in Pretoria feeding upon the soil under a pepper tree that had been practically defoliated by them, and on examination the alimentary canal was, in some cases, found to be completely filled with very fine particles of soil. The earth had probably been ground up between the mandibles or else only the very finest material was taken in. The cocoons can be found in a great variety of situations (tree-trunks, fence-posts, walls, stones, etc.) as much as thirty yards from the nearest pepper tree. The actual making of the cocoon was not observed, and it would be interesting to know whether the " cocoon paste " is produced from the mouth or the anus. There can be no doubt that the larva uses finely divided soil as the principal ingredient of the paste with which it makes its cocoon, and that the soil is first taken into the intestine by direct feeding. A large percentage of the larvae were parasitised by a Tachinid fly; some of them died before pupation, but many succeeded in constructing their cocoons. Practically all the young larvae and many of the larger ones were killed by spraying once with a mixture of " Katakilla " slightly stronger than that recommended by the makers.

Lounsbury (C. P.). **Sodium fluoride for cockroaches.**—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 1, July 1914, p. 76.

It is recorded that sodium fluoride, a white flour-like powder, was most successfully used against cockroaches in a Durban house, which was overrun with a very large native species and the small common *Ectobia germanica*, the latter predominating.

**Phylloxera in the Transvaal.**—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 1, July 1914, pp. 77–78.

The introduction of grafted vines from the Western Province is probably responsible for the establishment of *Phylloxera* in a considerable number of places in the northern provinces. American vines used as stocks are all more or less subject to the attack of *Phylloxera*, but are able generally to flourish in spite of being infested, though some stocks used in the Western Province possess so low a degree of resistance that they have succumbed to the attack in the course of a few years. It is only rarely that the pest has been actually observed in a vine nursery, but it is probably present to at least a slight extent in most Western Province nurseries.

Lounsbury (C. P.). **The Vine Mealy Bug.**—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 1, July 1914, pp. 98–99.

This note cautions growers against the danger of introducing and spreading the Vine Mealy Bug with cuttings or young vines. If

cuttings for propagation purposes have to be taken from an infested vineyard, the precaution of thoroughly fumigating them with hydrocyanic acid gas (1 oz. to 150 cubic ft.) should always be exercised. This gas penetrates crevices slowly, and plants exposed to it should not be tied tightly in bundles. It is illegal to send vines from the south-western districts of the Cape to other parts of the Union unless they have been fumigated.

**"Slug Caterpillars" or "Nettle Grubs" of Tea.**—*Trop. Agric., Peradeniya,* xliii, no. 1, July 1914, pp. 51–55.

Several species of LIMACODIDAE feed in the larval stage on tea and at times do a considerable amount of damage, but if the earliest caterpillars are systematically collected and destroyed, much labour and expense will be avoided. The collectors should protect their hands from the urticating liquid secreted by these larvae. As a spray, lead arsenate is preferable to Paris green, which is liable to burn the foliage; 4 lb. of lead arsenate should be used to every 100 gals. of water. In order to avoid the danger of arsenical poisoning, pluckings from the sprayed area should be rejected until the new growth, which was in bud at the time of spraying, has developed. Any loss would be amply repaid by the freedom of subsequent crops from attack. All prunings and refuse should be burned and the pruned and surrounding bushes carefully searched for cocoons and stray larvae.

*Natada nararia,* the fringed nettle-grub, is probably the most destructive species in Ceylon. The larvae are attacked by an Ichneumonid, and many of them perish from what is perhaps a fungoid disease. The pupal stage lasts 17 days. The blue-striped nettle-grub (*Parasa lepida,* Cram.) has been recorded on cacao, coconut, plantain, coffee, castor, mango, asphal (*Nephelium longana*) and country almond (*Terminalia catappa*), as well as on tea, and the pupal stage occupies from 4 to 5 weeks. *Apanteles* sp. have been reared from the caterpillars of this species and the cocoons of these parasites are often destroyed in mistake for eggs of their host. Besides attacking tea, *Thosea cervina,* Moore, feeds on *Piper nigrum,* and its cocoons are to be found from 1 to 1½ inches below the surface on the ground. *Thosea recta,* Hamp., has been found feeding on *Albizzia,* and *T. cana,* Wlk., the green nettle grub, feeds on castor in India.

KELLY (A.). **The false codling moth (*Enarmonia batrachopa,* Meyrick): with particular reference to its attack upon acorns.**—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 1, July 1914, pp. 72–75, 1 fig.

The adult moths of *Enarmonia batrachopa,* reared from acorns, laid their eggs very readily in confinement on oranges. The fruit was attached to branches with leaves, and whilst some eggs were found upon the foliage, the majority were scattered promiscuously upon the rind of the fruit. Upon acorns, the eggs are laid upon the smooth shell, and none were found upon the cup. During the daytime no moths were found on the wing in the open, and those in the breeding cages remained quiet, taking such shelter as the cage afforded. In confinement, eggs were invariably laid after nightfall, and there is no

reason to think that the moth behaves differently under natural conditions. Old acorns were picked up in December with fresh eggs upon them, whilst at the same time green acorns were being attacked; as many as thirty and forty eggs have been counted upon one acorn, but as one acorn only contains sufficient nourishment for at most three individuals, most of the caterpillars from these perish. The moths exhibit a marked disinclination to travel far before ovipositing. Of several hundred eggs kept under observation in May 1911, only one was parasitised, but 80 to 90 per cent. of egg parasitism by *Trichogrammoidea lutea*, Girault, was recorded from a source near by, for the month of April 1901. The full larval period occupied 84 days in one instance and 90 days in another. On emerging the young larva wanders about for some time before entering either orange or acorn. In the former the larva burrows into the rind almost anywhere, making a clean-cut entrance-hole which, for a while, is readily located by the resulting exudation. In acorns it enters near the base or the point of attachment to the cup. Careful observation failed to establish any instance where an entrance was effected at any other point, and the fact that the young caterpillars do not bore into the fruit immediately upon hatching indicates the possible value of insecticides. Pupation does not occur immediately after the cocoons are spun, but follows a resting period of about four days. The larvae prefer loose surface soil for pupation, but, if this is not available, will pupate in bark crevices, etc. The normal pupal period is eighteen days, and the period elapsing between egg-laying and the emergence of the moth averages 121 days for the winter months. It is thought that there are three generations, but that they are confused by a great deal of overlapping, as there is some evidence that the moths emerge all the year round. The life-cycle is always longer in acorns than when completed in deciduous fruits.

CARPENTER (G. H.). **Injurious Insects and other Animals observed in Ireland during the year 1913.**—*Econ. Proc. R. Dublin Soc., Dublin,* ii, no. 9, July 1914, pp. 142–160, 8 figs., 1 pl.

Larvae of the spring brood of the frit-fly, *Oscinis frit*, L., were found in Co. Tyrone, feeding within the sheathing leaves and boring into the stems of young oats, extensive damage being done. *Phyllotreta nemorum*, L., the turnip fly, was exceptionally abundant in the dry spring of 1913, many young cabbage-plants being killed outright in Co. Dublin; cabbage-leaves infested with *Aphis brassicae*, L., were received from Co. Waterford in September; potato-tubers were received in February from Co. Meath, hollowed out by the larva of a *Bibio*. The migratory apple aphid, *Aphis fitchii*, Sanderson, which has for many years been confused with *A. pomi*, De Geer, was recorded from Co. Galway; the hard winter eggs laid by the wingless females of this species usually hatch in April; the parthenogenetic females attack flower-buds and blossoms as well as foliage in the spring, but do not cause the leaves to curl; there are several generations of these on fruit trees until mid-summer. Apple shoots from Co. Armagh were found to be covered with ovisacs of the furze mealy-bug, *Phenacoccus* (*Pseudococcus*) *aceris*, Signoret, which is more common on furze, elm, laburnum, lime, and hawthorn than on apple, plum,

or rowan ; washes, such as quassia or paraffin emulsion or nicotin, are recommended against it. In May, specimens of the clay-coloured vine weevil, *Otiorrhynchus picipes*, F., were sent from Co. Tyrone, where they had been feeding on the bark of apple-tree shoots and currant bushes ; *Carabus nemoralis* appears to be an important enemy of these weevils. *Cheimatobia brumata*, L., was abundant in May and June in Co. Tyrone on black currants ; the affected bushes were planted in an apple orchard so as to occupy most of the ground between the trees, which were almost free from caterpillars, having been carefully grease-banded through the winter. Grease-banding currant bushes is impracticable, and spraying with arsenate of lead, unless done very early in the season, would render the fruit useless. Late in August, the caterpillars of the eyed hawk-moth *Sphinx* (*Smerinthus*) *ocellatus*, L., were received from Co. Cork, where they were devouring the foliage of apple trees ; this pest seems to attract attention in the south and south-west of Ireland more frequently than in the north. Bulb eelworms, *Tylenchus devastatrix*, Kühn., and mites, *Rhizoglyphus echinopus*, Fourn., are recorded as damaging narcissus and other bulbs, and details of experiments with these are given. *Blanjulus guttulatus*, Bosc, damaged strawberries in Co. Cork, and the roots of runner beans in Co. Dublin ; copper sulphate solution drives away this pest, but cannot be used on the edible parts of crops ; heavy autumnal dressings with salt and soot, and the burning of all refuse, has been found to clear the soil of *Blanjulus*. In July, specimens of *Achorutes armatus*, Nicolet, were received from Co. Wicklow, where they were feeding on beans in the soil. During the same month, *Lipura armata*, Tullb., was received from Co. Dublin, where it was infesting a greenhouse carnation bed and was trapped with pieces of orange-peel, potato, and carrot. Cyclamen-tubers attacked by *Otiorrhynchus* larvae were received from Co. Waterford in November. In September, caterpillars of the turnip moth, *Euxoa* (*Agrotis*) *segetum*, Schiff., were sent from Co. Wicklow, where they had done much damage to lettuces. Curled-up rose-leaves, harbouring the larvae of the rose sawfly (*Blennocampa pusilla*, Klug) were received from Londonderry in July ; willow shoots from Co. Wicklow, gathered in September, were found to be covered with colonies of the giant willow aphid (*Lachnus viminalis*, Fonsc.). On low trees in small plantations these insects can be crushed and killed by a gloved hand ; for their destruction on a large scale, spraying with quassia and soap-wash is recommended. In September, *Lachnus piceae*, Walker, the giant spruce aphid, from spruce, was received from Co. Kildare. The soft brown scale (*Eulecanium capreae*, L.) was a pest of horse-chestnuts in Co. Waterford, and in March a sample of wheat infested with the cheese mite (*Tyroglyphus siro*, L.) was received from Co. Cork.

South (F. W.). **Report on Locust Work, 1st May to 5th July, 1914.**— *Agric. Bull. Fed. Malay States, Singapore*, ii, no. 12, July 1914, pp. 323–326.

This report continues that of 12th March to 30th April, 1914 [see this *Review*, Ser. A, ii, p. 606]. Workers were engaged in Selangor from 4th May to 30th June in destroying the intermediate generation of hoppers, previously noted ; these occurred in a

long belt of country from Clang Gates to Ulu Pudu, and in other scattered districts; 786 swarms were destroyed by driving, from 9–13 gangs being employed every day, and only one swarm escaped. It was found at various places that new swarms hatched out without the laying of any additional eggs, sometimes as long as six weeks after the earlier swarms in the same localities had been first observed, indicating some delay in the hatching of the eggs. Poison, used for the first time in Selangor, was successfully employed against some of the swarms. Of the flying swarms that escaped from the regular generation of February and March hoppers, about 14, mostly small and definitely located, will lay their eggs about the end of July. In the Negri Sembilan locust destruction work continued from the end of April to the end of May. The hopper season lasted in the Tampin district from 1st April to 6th June; in the Seremban district from 30th March to 27th June, two generations appearing to have overlapped; on the coast, the generations are so intermixed that hoppers are always present. Altogether 1,183 swarms were destroyed by driving and 187 swarms by poison; in spite of this, large swarms of winged locusts were reported in June to be scattered throughout the Tampin district, and further breeding grounds are expected. Swarms bred inside the Malacca boundary seem to have entered S.E. Negri Sembilan, and the locusts being now concentrated in this district, effective work there will reduce them throughout the peninsula.

Feytaud (J.). **Les Termites.** [Termites.]—*Rev. Vitic., Paris*, xli, nos. 1072, 1073 &1077; 2nd & 9th July & 6th Aug. 1914; pp. 5–8, 41–46, 144–149; 1 pl.

*Leucotermes lucifugus*, Rossi, and *Calotermes flavicollis*, F., are the two species of termites found in France. The former occurs in the south-west in old, somewhat rotten pine stumps left in the ground, whilst the latter is only found in Languedoc and Provence, where it also attacks tree-trunks. *Leucotermes lucifugus* does not confine its attacks to pine stumps, but has done great damage to buildings at Bordeaux, Rochefort and La Rochelle. *Calotermes flavicollis* very rarely attacks timber in buildings. In France, attacks on living plants are relatively unimportant, and mainly limited to those weakened already, either by age, disease, or insect attack [see this *Review*, Ser. A, ii, p. 596–597]. The queens of *Leucotermes lucifugus* and *Calotermes flavicollis* are less prolific than is the case with some species, but produce many eggs daily over several years, so that the colonies increase quickly. Great stress is laid on the necessity of effecting the total destruction of a given colony, which the death of the queen is insufficient to complete, as a few workers, together with some nymphs or larvae, are able to continue the colony.

David (E.). **Sur le piégeage des papillons.** [On trapping the vine-moth.]—*Progrès Agric. Vitic., Montpellier*, lxii, no. 27, 5th July 1914, pp. 18–19.

The following formula for baiting vine-moth traps is given:—Water, 200 gallons, molasses, 200 lb., wine-lees, 16 pints. To start fermentation, ten times this quantity of wine-lees must be used, the above formula

being sufficient when preparing re-fills in order to maintain the bait-solution at its original level. In Gironde, few moths are taken in May owing to bad weather restricting flight. In any case it is worth while to try to catch even half the females before oviposition. In July, catches are heavy, but the period of flight only lasts from 8 to 10 days. During this time a large number of the females caught have not yet oviposited. In Médoc, few vineyards practised trapping in May, and the others are now suffering for their negligence.

Degrully (L.). **Pour capturer les papillons de Cochylis?** [The capture of *Clysia ambiguella* moths ?]—*Progrès Agric. Vitic., Montpellier,* lxii, no. 28, 12th July 1914, pp. 35–36.

The author suggests that the adults of *Clysia ambiguella* might be captured with greater ease than at present by spraying the vine leaves with a sticky liquid capable of retaining the moths when they come in contact with it.

Fonzes-Diacon (—). **La bouillie bourguignonne.** [Burgundy mixture.] —*Progrès Agric. Vitic., Montpellier,* lxii, no. 29, 19th July 1914, pp. 70–80.

The author discusses neutral, acid and alkaline Burgundy mixtures and their effects in the laboratory. The superiority of acid sprays is considered to be due not only to the excess of free copper sulphate which they contain, but also to the presence, both in the precipitate and in the solution, of tetracupric sulphate. This latter salt is insoluble in water, but most sensitive to the solvent properties of the carbonic acid contained in the atmosphere. This same basic sulphate also ensures the enhanced keeping qualities of acid sprays. Wetting Burgundy mixtures should be of the acid variety. In preparing these acid sprays the dilute solution of sodium carbonate should be slowly poured into the concentrated solution of copper sulphate, the latter being constantly stirred meanwhile. The dose of sodium carbonate (90 per cent. pure) necessary varies between $11\frac{1}{2}$ oz. and 13 oz. per 2 lb. of copper sulphate, and if these quantities be dissolved in 20 gallons of water, an acid spray containing from 2 to 5 parts per thousand of free copper sulphate will result.

Wilson (H. F.). **A New Sugar-Cane Aphis.**—*Entom. News, Philadelphia,* xxv, no. 7, July 1914, pp. 298–299, 1 pl.

The author describes the alate viviparous female and the apterous viviparous female of a new aphid collected on *Saccharum officinarum* at Audubon Park, New Orleans, Louisiana, during 1912, which he names *Aphis, bituberculata,* sp. n.

Fryer (J. C. F.). **Preliminary Notes on Damage to Apples by Capsid Bugs.**—*Ann. App. Biol., Cambridge Univ. Press,* i, no. 2, July 1914, pp. 107–112, 2 pls.

The fact that Capsid bugs do serious damage to apples has been known in England for several years, but the question as to which of various species is the real offender is difficult to decide. In America,

they are known as pests both of apples and pears, and though, with the exception of *Lygus pratensis*, F., the species are not those found in Europe, the type of injury is much the same, and doubts also exist as to the exact species which does the damage, though it is very serious. Primary damage is caused by the puncture made by the bug in feeding, either from the direct loss of sap or possibly from the direct injection of some irritant material, the result being distorted and misshapen fruit. In the case of apples, the injury takes place very early in the season, possibly before the blossoms open. The bugs appear to feed equally on the young fruit, foliage and young shoots, though the injury to the fruit is the serious feature. Damage to both fruit and foliage is completed early in the season, and though the bugs continue to puncture the foliage, little further harm seems to ensue. The injured fruit is almost unsaleable, and cases have been seen in which 30 per cent. to 50 per cent. of the crop was stated to have been affected, without taking into account fruit which was so damaged that it fell before reaching maturity. The attack appears also to maintain a high degree of intensity for several consecutive years in the same orchard. In England the attacks of these bugs are very local in the numerous districts in which they occur. *Psallus ambiguus* was found in quantity in both affected and unaffected orchards, and is therefore eliminated from consideration. It is a small brown or red species and was common wherever apples were grown. According to Theobald, *Atractotomus mali* is responsible for damage in Kent, but of seven orchards examined it was absent in two affected, present in two others, and also present in very large numbers in an unaffected orchard. Two other species, *Plesiocoris rugicollis* and *Orthotylus marginalis*, were both present in two of the affected orchards and in each of the other cases of attack, one or other was present. They were also absent from an unaffected orchard, with the exception of one in Worcester, where *O. marginalis* was recorded as present from two specimens only. It would therefore appear that one or both of these species are responsible for the injury, and this was more or less confirmed by an experiment carried out in a Worcester orchard. A number of trusses of fruit were selected and sleeved. The larvae of these two species were enclosed with some and carefully excluded from others. Those trusses from which the bugs were excluded developed sound fruit, whilst others with which the larvae were enclosed sustained typical Capsid damage. The life-history of either species is not known. According to Butler, they appear rather late in the season, larvae being found in June and July, and adults at the end of July and in August. There is no evidence of a second generation. The author inclines to the view that the apple has somewhat recently been adopted as a food-plant, and that this change has brought about an alteration in the time of appearance of the insect. Inasmuch as the damage is done soon after the insects leave the egg, it is evident that any spray treatment must be carried out at exactly the right time, and that a contact poison must be used. Nicotin and soap have given fairly good results in America, provided the trees be very thoroughly drenched and the spray applied both before the blossom opens and after it falls. A wash of this kind was only partly successful in England, and in one case there was no benefit whatever, the reason given being that the bugs hatched out over a long

period. Possibly two species were present, not appearing at the same time. Winter washes are not considered to be of any value because they are of no use against winter eggs in general, and it will probably be found that the eggs of these bugs are deeply embedded in the bark of the twigs. References to six papers on the subject of Capsid injury are given.

DAVIDSON (J.). **The Host Plants and Habits of *Aphis rumicis* Linn., with some observations on the Migration of, and Infestation of Plants by Aphides.**—*Ann. App. Biol., Cambridge Univ. Press,* i, no. 2, July 1914, pp. 118–141.

According to Theobald, *Aphis rumicis* has a double life-cycle. In one cycle, ova are produced by the sexuparae in late autumn, on *Rumex*; these hatch in spring, and winged migrants are subsequently produced on these plants; these migrants go about June to broad beans, which they infest throughout the summer; in autumn the winged migrants from the broad beans return to *Rumex*.

In the second life-cycle, ova are produced by the sexuparae on *Euonymus* in late autumn or winter, which hatch in spring; the winged migrants produced migrate to poppies in June, and this form is known as *Aphis papaveris*. In some years, when the number produced is abnormal, some of them go from the poppies to mangolds and many plants of the family Chenopodiaceae; in autumn they return to *Euonymus*.

The aphids taken from these different plants showed no structural differences, although they differed slightly in size or colour on the different host plants. If these two parallel life-histories for *Aphis rumicis* are stable, the question of the influence of the host plants on aphids becomes an important factor. The two life-cycles seemed to show that the preceding host plant upon which a generation of aphids is produced has a determining influence on the species of plant subsequently selected by the winged migrants. Theobald found that winged viviparous females taken from *Euonymus* lived on broad beans and gave rise to the "bean black fly," but was unable to trace whether the winged migrants from *Euonymus* went to broad beans, and it seemed probable that the two parallel life-cycles might be merged into one by crossing from *Euonymus* to broad beans and from *Rumex* to poppies. If the two life-cycles proved to be absolutely constant and separate, two biological species would be established (*A. euonymi* and *A. rumicis*), resembling each other in structure, but differing physiologically in habits. From the experiments recorded in this paper it would appear that *A. euonymi* will heavily infest broad beans and that the same aphis reared on *Rumex* will heavily infest both broad beans and poppies; thus the two life-cycles may be merged into one. The results of a long series of experiments on transference of *Aphis* to various plants are given, and in the author's opinion do not furnish sufficient evidence that the previous host plant has an influence on the degree of infestation of the succeeding ones to which the winged migrants were transferred. Winged viviparous females in these experiments showed a marked tendency to migrate and collect in vast numbers on the top of the muslin bags covering the plants. They seemed active and restless and apparently not feeding on the host

plant on which they were produced, and when the top of the cover was open they immediately took flight, and it would thus appear that the winged females demand a change of host plant. The cause of this desire to migrate is not clear. It may be due to a simple instinct or to a change in the constitution of the cell-sap of the host plant on which the aphids feed having an influence on the production of winged forms and the consequent migration of the aphids of the original host plant. The author considers it not improbable that in the case of small plants heavily infested with aphids, the cell-sap may be rendered toxic, or at any rate distasteful to the insects. On heavily infested plants the aphids became smaller and apparently derived no nourishment from the host. The actual structure of the pharynx of the aphis and the manner in which the food passes into its body is said to be such that changes in the surface tension of the cell sap may profoundly affect their capacity for feeding. Theobald has recorded the migration of *Aphis rumicis* in the South of England in 1911. Poppies became heavily infested and subsequently masses of winged migrants were distributed over many different plants, but only flourished to any great extent on dahlias, beet and mangolds.

Those interested in this subject should consult the original paper.

Munro (J. W.). **A Braconid Parasite on the Pine Weevil** (*Hylobius abietis*).—*Ann. App. Biol., Cambridge Univ. Press,* i, no. 2, July 1914, pp. 170–176, 4 figs.

Near Aberdeen the stumps and roots of Scots Pine which had been left on the ground occupied by the existing plantations contained large numbers of *Hylurgus piniperda* and *Hylobius abietis*. In July 1913 several weevil larvae were found, apparently in the resting stage, but attacked by a small legless maggot feeding externally on them and sucking their juices. These larvae when supplied with fresh grubs fed on them readily, crawling 2 or 3 inches to reach their prey. Observations showed that they fed through the skin of their host and were purely external parasites. They ceased feeding in September, moulted a few days later, and on September 25th began to spin cocoons. On 20th February 1914, there were pupae in two out of five cocoons and nine days later the first imago appeared, others continuing to emerge up to and after April 14th. The perfect insect was recognised as a Braconid agreeing very closely with Ratzeburg's description of *Bracon hylobii*, and, if they are this species, they are new to Britain. The degree of parasitism is estimated in the 3rd and 4th years of the appearance of the pest at over 30 per cent., and the parasite may prove of considerable value in combating the pine weevil, which is becoming more common every year in new plantations, especially in Scotland. The parasite is easily reared and is apparently hardy. The specimens were obtained on a bleak hillside near the coast and over 600 feet above sea-level, swept by cold north and east winds. From 70 cocoons no hyperparasites were obtained. The fact that *Bracon hylobii* attacks the weevil larva in its resting stage is interesting, as is also the great increase in the numbers of parasites as compared with those of the weevil.

CHILDS (L.). **Oak Pests—The Carpenter Worm** (*Prionoxystus robiniae*). —*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 7, July 1914, pp. 259–264, 5 figs.

The Cossid, *Prionoxystus robiniae,* is reported from nearly all parts of the United States, and in California occurs in the following trees:— oak, elm, willow, locust, cottonwood and carob. The trunks are chiefly attacked, although in trees which have been long infested the larvae will be found burrowing in the larger limbs. Frass indicates the presence of the pest, and from the open wounds the tree discharges a dark sap-like substance which discolours the trunk. The eggs are deposited in the crevices of the bark, etc. Upon hatching, the young larva feeds in the cambium, just beneath the bark, for some time, and then gradually works its way into the wood. Pupation usually occurs near the end of the third year and lasts for a fortnight. Seriously infested trees may be saved by the continual injection of carbon bisulphide and the killing of the larvae by hand with wires.

GRAY (P.). **The Compatibility of Insecticides and Fungicides.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 7, July 1914, pp. 265–267, 1 table.

The cost of spraying materials is trifling compared with the cost of application, and therefore if the materials or the operation can be combined in any way, a great saving of expense will result, but it unfortunately requires chemical knowledge in order to decide what sprays may be mixed without mutual destruction. Incompatibility may be of two kinds, chemical or physical, or both, but there are cases in which chemically incompatible materials may be mixed without impairing the original killing, preventive, or physical properties of the ingredients. A table is given showing the results of mixing, which is briefly stated as follows:—

Better results by mixing:—Paris green with Bordeaux mixture and iron-sulphide. Lead Arsenate with the same. Zinc-arsenite with iron-sulphide. Soap and Bordeaux mixture. Tobacco with emulsions.

Properties not changed by mixing:—Calcium-arsenite with Bordeaux mixture, iron-sulphide or tobacco. Lead-arsenate (acid) and tobacco. Lead-arsenate (neutral) with Bordeaux mixture, iron-sulphide, tobacco, soaps, emulsions and alkalies. Zinc-arsenite with tobacco. Lime-sulphur with cyanide fumigation or tobacco. Soap with tobacco, emulsions or alkalies. Tobacco with cyanide fumigation and acids.

Efficient, non-injurious:—Lead-arsenate (neutral) with lime-sulphur. Soap and Bordeaux mixture, tobacco and alkalies. Bordeaux mixture and alkalies.

Inefficient, non-injurious:—Neutral lead-arsenate with acids. Lime-sulphur with soap, alkalies or acids. Emulsions with iron-sulphide. Tobacco with Bordeaux mixture, acids and alkalies.

Dangerous:—Paris green with lime-sulphur, cyanide fumigation, soaps, emulsions, alkalies and acids. Calcium-arsenite with lime-sulphur and the same. Lead-arsenate (acid) with soaps, emulsions or alkalies. Zinc-arsenite with lime-sulphur, soaps, emulsions, alkalies and acids. Lead arsenate (neutral) with acids. Emulsions

with lime-sulphur, alkalies and acids. Cyanide fumigation and Bordeaux mixture. Bordeaux mixture with acids or iron-sulphide. Alkalies and iron-sulphide.

The author presents the table with some hesitation, as the chemical knowledge required to enable a positive statement to be made as to the good or evil effect of certain mixtures, and, indeed, the practical experimental evidence, is still wanting in a very large number of cases.

Weldon (G. P.). **A light trap for catching cutworm moths.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 7, July 1914, pp. 284–285, 1 fig.

A light trap, which the American Sugar Beet Company used with phenomenal success, is described and figured. The trap is constructed of a shallow galvanized iron pan about 4 feet in diameter, set on a platform a few feet above the ground. Over the pan, which contains oil, is hung a gas burner enclosed in a globe and connected with a tank within the frame, in which acetylene gas is generated. On one morning the moths found in one such trap were estimated at from 1,200 to 1,500. Another trap, placed on a beet dump with an electric light to attract the moths, is said to have caught as many as 7,000 moths in a single night. According to J. E. Graf most of the moths were the common cutworm, *Peridroma saucia.*

Weldon (G. P.). **The peach twig-borer** (*Anarsia lineatella*).—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 7, July 1914, p. 287, 1 fig.

On the 19th May 1914, larvae of *Anarsia lineatella* were found in freshly constructed hibernating cells in the forks of young peach trees. Again on 23rd June an abundance of very small larvae were found in hibernaculae. In this case they were in forks of peach trees which were probably five years of age and upon which there was much fruit. These observations are believed to indicate the presence of only one strung-out brood of this insect, instead of three, or even four, as has been previously reported.

**Insect Notes.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento* iii, no. 7, July 1914, p. 296.

*Eulecanium canadense,* Ckll., is reported on elms, and the Scarabaeids *Serica alternata,* Lec., and *Phobetus comatus,* Lec., on fruit tree foliage; *Myochrous longulus,* Lec., ruined thirty acres of cotton in April. *Tetranychus bimaculatus,* Harv., has injured maple foliage, and numerous adults and larvae of the alfalfa butterfly, *Colias* (*Eurymus*) *eurytheme,* Boisd., are reported on lucerne, to which the yellow-striped cutworm, *Prodenia praefica,* has also done damage. During June, *Pyrameis cardui* did some damage to various plants; sweet birch was heavily infested by *Chionaspis salicis-nigrae.* A Tachinid, an Ichneumonid, and a Braconid, apparently *Apanteles* sp., have kept *Schizura concinna* in check; *Eulecanium robiniarum* was common on mountain holly; about seven hundred pounds of *Hippodamia convergens* were collected in June; the European elm scale, *Gossyparia spuria,* killed large limbs of elm trees.

Heidemann (O.). **A New Species of North American Tingitidae.**—*Proc. Ent. Soc., Washington, D.C.*, xvi, no. 3, Sept. 1914, pp. 136–137, 1 fig.

A new species of North American Tingitidae, *Gargaphia solani*, is described from specimens obtained from Kirkwood, Mo., on *Solanum carolinense* and *S. elaeagnifolium*; from Lavaca Co., Texas, on coffee weed and *Solanum*; from El Reno, Okla., and Norfolk, Va. This species is found on egg-plants and potatoes in great abundance, and seems to have a wide range of distribution from the Atlantic coast to the South-Western States.

Gibson (A.). **The Injurious Flea-beetles of the Province of Quebec.**—*6th Ann. Rept. Quebec Soc. Prot. Plants from Insects and Fung. Dis., 1913-14, Quebec*, 1914, pp. 25–30, 5 figs. [Received 16th November 1914.]

This is a summary of an earlier paper by the author [see this *Review* Ser. A, i, pp. 298–300], the Quebec species in order of economic importance being *Phyllotreta vittata, F.*, *Epitrix cucumeris*, Harr., *Systena frontalis*, F., *Haltica chalybea*, Ill., *S. marginalis*, Ill., *Disonycha xanthomelaena*, Dalm., and *P. armoraciae*, Koch.

Du Porte (E. M.). **Insects of 1913.**—*6th Ann. Rept. Quebec Soc. Prot. Plants from Insects and Fung. Dis., 1913–14, Quebec*, 1914, pp. 38–43, 3 figs. [Received 16th November 1914.]

The larvae of *Melanotus communis* and *Agriotes mancus* were responsible for the destruction of much sown maize. Clover was badly affected by the clover Chalcid, *Bruchophagus funebris*, the clover-root borer, *Hylastinus obscurus*, and the clover mite, *Bryobia pratensis*. *B. funebris* larvae were only found in the seed of the common red and mammoth red clovers; adults were observed flying about the heads of the alsike clover, but no grubs were obtained from this variety. The grubs were first observed in the red clover seed in July, at which time no adults could be found about the heads. In the laboratory, adults began to emerge about the middle of July, and after that, and throughout the greater part of August, they were present in large numbers, depositing their eggs in the young seeds. In many heads examined in small experimental plots there was complete failure to ripen seed, although most of the flowers had been fertilised. A small Chalcid parasite was reared from the clover-leaf midge, *Dasyneura trifolii*, which was quite common on the leaves of white clover. The turnip flea-beetle, *Phyllotreta vittata*, was abundant in the rootfields, and early in the season did much injury to young turnips. Considerable damage was caused among radishes by the wavy flea-beetle, *P. sinuata*, which seems not to have been previously reported as a pest in Quebec Province.

Potatoes suffered severely from the flea-beetles, *Epitrix cucumeris* and *Systena hudsoniae*. *Pieris rapae* was extremely abundant on cabbage and other cruciferous plants, but its parasites, chief among

which were *Pteromalus puparum* and *Apanteles glomeratus*, were equally active. A Cynipid parasite, *Trybliographa anthomyiae*, was reared from the pupa of *Chortophila* (*Phorbia*) *brassicae*, the cabbage root-maggot, which caused considerable reduction in the yield of early cabbages ; large numbers of the Staphylinid, *Aleochara nitida*, which preys on the maggot, were present in the infested soil. The turnips of experimental plots were attacked by *Chortophila* (*Phorbia*) *fusciceps*, an Anthomyiid much resembling the cabbage root-maggot. The beet leaf-miner, *Chortophila* (*Pegomyia*) *vicina*, attacked spinach in the spring, causing considerable damage ; beets did not suffer much, but some varieties of mangels were severely attacked. The Hemipteron, *Coriscus ferus*, was abundant on the affected mangel leaves ; it was not observed feeding on the maggot in the fields, but specimens brought to the laboratory fed greedily on maggots put in the same cage. A small Braconid parasite was bred from the pupa of *P. vicina*, and parasitic larvae, probably of this Braconid, were observed within the maggot. The cabbage *Aphis*, although present in numbers, was effectively kept in check by ladybirds. *Crioceris* 12-*punctata* was abundant, but no specimens of *C. asparagi* were observed. The forest and orchard tent-caterpillars, *Malacosoma disstria* and *M. americana*, were the most abundant and destructive insects of the season. All unsprayed orchards in the vicinity of Macdonald College were completely defoliated, as well as many shade trees and acres of woodland. Parasites of these insects were more abundant than in the preceding year and large numbers, especially of the orchard tent-caterpillar, were destroyed in the larval stage by a bacterial disease, while of pupae collected at the end of June, about 45 per cent. were parasitised by insect parasites. The maggot of a Tachinid fly was the most abundant, but some Ichneumonids were also collected. The robber fly, *Dasyllis flavicollis*, was observed preying on the adults of *M. disstria*, but was not sufficiently abundant to be of any practical importance. The codling moth, *Cydia pomonella*, was abundant in many orchards. Considerable injury to apple, plum, cherry, and pear was done by the bud moth, *Eucosma* (*Tmetocera*) *ocellana*. The second brood of the pear-tree slug, *Eriocampoides limacina*, did much injury to plum, amelanchier and cherry. The apple maggot, *Rhagoletis pomonella*, continues to be a pest.

Bryce (P. I.). **Some Beneficial Hemiptera of Quebec.**—*6th Ann. Rept. Quebec. Soc. Prot. Plants from Insects and Fung. Dis., 1913–14, Quebec*, 1914, pp. 52–53. [Received 16th November 1914.]

This paper includes popular descriptions of *Perilloides* (*Perillus*) *circumcinctus*, *P. bioculatus*, *Podisus serieventris*, and *Podisus modestus*. Nymphs and adults of both species of *Perilloides* feed on the larvae and adults of Colorado potato-beetles and other Coleoptera. *P. serieventris* in all its stages attacks the larvae of *Callosamia promethea*, the tent-caterpillar (*Malacosoma*), fall webworm (*Hyphantria*), the gipsy moth (*Lymantria dispar*), and several Hemiptera ; while *P. modestus* feeds on the larvae of *Hemileuca maia*, the Tamarack saw-fly, the steel-blue flea-beetle, and also on clematis and golden-rod.

VOGLINO (P.). **Osservazioni sulle tignole della vite eseguite nel Piemonte nel 1913.** [*Polychrosis botrana* and *Clysia ambiguella* in Piedmont in 1913.]—*Osservatorio consorziale di Fitopatologia in Torino, Turin*, 1914, 35 pp.

As the result of a conference between the Agricultural Committee of Turin and the Subalpine Vine-Growers' Society, held on 22nd February 1913, a Commission was appointed to study the means of controlling the ravages of vine moths and to determine the value of tobacco extract for this purpose. The carrying out of the experimental work was entrusted to the Turin Phytopathological Observatory. Special stations for observation were established in the provinces of Turin, Cuneo, Alessandria and Novara. Observations were also made in districts without special stations. The results obtained show that in Piedmont *Polychrosis* is more widely distributed than *Clysia*. The latter was occasionally numerous (50–80 per cent.) in colder districts at the mouths of the mountain valleys and was also frequent (50–65 per cent.) at Gattinara, in the province of Novara. In the true vine-growing districts exposed to the sun in the provinces of Turin, Alessandria and Cuneo, *Clysia* varied from 2 to 4 per cent., and in exceptional cases 10 per cent.

The development of *Polychrosis* has a direct relation to the humidity of the air and is favoured by damp. Spring changes of temperature which have an injurious effect on the growth of the vines, have little effect on the development of the insect. The spring flight of moths occurred throughout May at practically all stations; in one station only they continued to appear until the beginning of June. They lived from 13 to 15 days and oviposited on the stalks of the bunches and the pedicels of the flowers, especially in the second half of May, but also in the first week in June. The larvae of the first generation appeared at the end of May, pupation taking place from about the 10th June until July. The summer generation appeared at the observatory on 26th June, and at the stations during the early days of July, with a maximum from the 14th to 22nd. The moths lived 11 to 14 days and began depositing eggs on the grapes about the 15th July, continuing until early in August. The larvae of the second generation appeared during the last week of July and in August, pupating at the end of the month. The autumn brood only appeared at three stations from the 17th to 22nd September shortly after the vintage, and it is only at Barolo that there was supposed to be a third generation of larvae on the Nebiolo vine. The mode of cultivation has considerable influence on the development and spread of the pest. Where the canes or wooden supports are replaced by iron, sandstone or concrete, the number of insects is considerably reduced. Instead of watching for the first appearance of the moth in the vineyards, small gauze cages containing pupae should be suspended along the rows and the date of emergence noted. The results are better than those obtained by lamp traps, because *Polychrosis* only flies at dusk. Bordeaux mixture with 2 to 2·5 per cent. of tobacco extract was found to be an effective dressing, but the addition of 1 per cent. of sodium carbonate to plain tobacco extract was found to make a more efficient dressing than the combination of tobacco and Bordeaux mixture. An intermittent jet

is advised. Tobacco dust had no effect upon the larvae. Lead arsenate, 1 per cent. solution combined with Bordeaux mixture, gave good results, either as a spray or when used for dipping the young bunches. Lead arsenate against the first generation of larvae is likely to give the best results until a reliable standard of nicotin extract can be obtained. During July and August it is better to use tobacco extract, 2 to 2·5 per cent., as it acts as an insectifuge and avoids the difficulties of arsenate. The treatment should not continue later than the first few days of August, owing to the danger of affecting the flavour of the wine. The spray should be made to cover neighbouring shoots, as the moths driven from the bunches of grapes would deposit their eggs on the leaves, and the larvae might reach the fruit. All possible hibernating places must be removed, the vine-stocks cleaned, and in small vineyards handpicking in addition to the use of insecticides should be resorted to. Many pupae may be trapped by placing dark muslin or bunches of straw among the old wood of the vines. Badly attacked grapes should be placed in tubs covered with fine netting and exposed, so that parasites may escape.

Hollrung (M.). **Beiträge zur Kenntnis der Eichen-Phylloxera. I. Die Entwicklungsgeschichte der Laus.** [Contributions to the knowledge of Oak Phylloxera. I. The life-history of the louse.]—*Kühn-Archiv, Berlin,* v, 1914, pp. 347–382, 5 figs.

In view of the uncertainty regarding the identity of the several species of *Phylloxera* found on the oak, the various communications on the subject, from the discovery of the genus down to 1909, are recorded. The species on which the present observations are based is thought to be *Phylloxera quercûs,* Boyer de Fonscolombe, though according to Börner it is *P. coccinea.* The oak phylloxera hibernates in the form of a winter-egg in cracks of the bark or of dried leaf-buds. The insect itself does not hibernate above ground, though whether it does so below ground is uncertain. After hatching, the young fundatrix moves actively about on the young oak leaves for a short time until the first moult, when it fixes itself on the underside of a leaf close to a vein. In two or three days the edge of the leaf folds downwards and backwards until it lies flat against the underside. Only one fundatrix is found in a fold, except in cases of severe infestation. In 1911, the first generation was completed by the end of May and the young of the second were already noticeable on the 15th May, becoming abundant at the end of that month. On the 6th June, the first eggs laid by the mothers from the second generation were noticed. Feeding conditions, which are dependent on weather conditions, are the factors governing the appearance of winged forms. Dry weather cuts short the supply of moisture in the leaf and the insects assume the winged form and migrate, those individuals which are favourably placed for obtaining moisture remaining untransformed. In Italy, the first generation usually transforms in spring, but on the Igelsberg (between Naumburg and Weissenfels on the Saale) the transformation of second generation individuals in the dry year of 1911 only occurred on heavily infested leaves. In 1910, the leaves were full of sap and no nymphs of the second generation were observed. The nymphs of the third

generation appear to be similar to those of the second. The author gives the name of hemialatae to incompletely alate individuals of the third generation. The life of the third generation depends on the food capacity of the host-plant. The sexual forms appear about August on the Igelsberg. The winter-eggs are destroyed in immense quantities during the winter and this contributes to the continuance of the species, otherwise the huge numbers would destroy the host-plants. The prolific nature of the fundatrix (100 to 200 eggs) and of the second generation (40 to 60 eggs) is quite sufficient to balance the destruction of 999 out of every 1,000 winter-eggs laid. Late in the year, the author has often noticed newly hatched young which he believes to be a fourth non-sexual generation. Possibly they belong to a much retarded third generation. The paper closes with a bibliography of 49 works.

Lüstner (G.). **Relation between the Larvae of Vine Moths** (*Conchylis ambiguella* **and** *Polychrosis botrana*) **and the Weeds of Vineyards and other Plants.**—*Zeitschr. f. Weinbau und Weinbehandlung Berlin*, i, no. 1, 1914, pp. 3–35.

The author has experimented with 92 species of plants, mostly vineyard weeds, as food for the larvae of *Clysia* and *Polychrosis*. In the case of the former species the experiments were carried out from the beginning of September to the middle of October and the larvae were found to be distinctly polyphagous, devouring even Euphorbiaceous plants. It is therefore concluded that the mere spreading of obnoxious substances over the buds and fruits of the vine will be of little use against these larvae. They were also found to devour the tips of shoots and young leaves, which are not generally found to be attacked. It is concluded that these pests feed on the shoots of the vine, or failing this on common weeds, so that measures for the control of the pest by the immediate removal of the fruit attacked are not adequate ; enclosing the bunches of grapes in bags serves to protect the fruit, but does not decrease the danger of the spread of the insects ; brushing the first shoots showing signs of attack is not effective in destroying the larvae, since they find shelter elsewhere, and this procedure is liable to cause damage to the shoots themselves.

Vassiliev (I. V.). **Главнѣйшія насѣкомыя, вредящія люцернѣ. Часть II. Люцерновый слоникъ, его описаніе, образъ жизни и мѣры борьбы съ нимъ.** [The principal insects injurious to Lucerne. Part II. *Otiorrhynchus* (*Cryphiphorus*) *ligustici*, L., its description, life-habits, and methods of fighting it.]—Second, (enlarged) edition.—**«Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *Petrograd*, 1914, 39 pp. 15 figs.

This paper forms the second part of the author's publications on insect pests of lucerne, the first one (Memoirs of the Bureau of Entomology, vii no. 4, 1908), having dealt with *Adelphocoris lineolatus*. The necessity for a closer study of *Otiorrhynchus ligustici*, L., arose out of the great importance of this pest to lucerne crops and

also out of the obscure state of our knowledge of its biology. A minute description of all the stages of the weevil is given.

*O. ligustici* is found everywhere in Europe, except in the most southern parts, while in Russia, Tobolsk appears to be its eastern limit. The weevils hibernate in the soil, appearing in spring during April. In the government of Ekaterinoslav, a great migration takes place during May, the weevils searching for such food-plants as lucerne, *Melilotus officinalis* or *M. alba.* During this time they do a great amount of damage, though less than that done subsequently by the larvae. Oviposition starts in the middle of May, and the eggs are deposited at a depth of 1 to 2 inches round the roots of the food-plants. At first the larvae make unimportant wounds in the collars of the plants, but very soon burrow deeper into the earth in search of the ends of the roots, on the parenchyma of which they feed. The depth at which the larvae live varies from the surface to 20 inches below it, according to the moisture in the soil, etc. After heavy rains, they come near the surface owing to lack of air. The larval stage lasts a whole year and pupation takes place in the second half of May and during June, the pupal stage lasting from 3½–4 weeks, the average depth at which the pupa are found being about 11 inches. The result of the damage done appears after the beginning of August in the form of yellow patches of withered plants.

The following Coleopterous enemies of *O. ligustici* have been recorded :—*Calosoma inquisitor*, various species of *Poecilus* and *Feronia, Hister sinuatus,* and STAPHYLINIDAE ; in only a few cases were weevils found to have been killed by the muscardine fungus.

Preventive remedies against this pest aim at the protection of lucerne fields from an invasion by the weevils and consist of (1) spraying with Paris green of a strip of 21–28 feet wide round the fields and about 14 feet of the adjoining lands; a solution of 2–3 lb. of green and 6 lb. of quicklime in about 110 gallons of water produced a death rate of 90 per cent. and proved much more effective and less injurious to lucerne than 6lb. of barium chloride and 9 oz. of joiner's glue in 11 gallons of water, which only killed 8 per cent. of the weevils. (2) Lining the fields with boards laid lengthwise and smeared on the outside with a sticky material; care must be taken that the boards are well set in the ground and that the ends fit closely, so that no holes are left for the possible passage of weevils; these boards must be in place before the spring migration starts. (3) Trenches round the fields, filled with water in places where irrigation is practised, or with steep sides and pits along the bottom at intervals where no water is available, the weevils being periodically collected and destroyed by means of boiling water or by burning with naphtha.

Destructive remedies include (1) spraying with Paris green (4 lb. of green and 4 lb. of lime in 110 gallons of water); (2) ploughing infested spots to a depth of 10–11 inches at the beginning of summer, in order to destroy the pupae, but in this case it is first necessary to ascertain that the majority of the larvae have already pupated; (3) handpicking and collection of the beetles in spring.

A supplementary chapter deals with the parthenogenesis of *O. ligustici* and describes the author's experiments, which have confirmed this phenomenon, and, according to Silantiev this is also true in the case of *O. turca.*

De (M. N.). **Instructions for Rearing Mulberry Silkworms.**—*Agric. Research Inst., Pusa,* Bull. no. 39, 1914, 25 pp., 4 pls., 3 figs.

*Trycolyga bombycis*, which according to Villeneuve is a synonym of the widely distributed *T. sorbillans*, Wied., causes great havoc among silkworms; one female may lay as many as 350 eggs, one on each larva. These eggs hatch in three or four days, and the larva enters the body of the caterpillar, feeding upon the tissues of the host, which dies in 10 or 12 days. Against these flies the only preventive measure that can be adopted is to destroy the larvae when they emerge from the body of their hosts. The flies may be prevented from entering the rearing-room by small-meshed wire gauze nets or bamboo chicks in doors and windows.

Patterson (W. H.). **Report of the Entomologist.**—*Rept. Gold Coast Agric. Dept. for 1913, Accra,* 1914, pp. 18–27. [Received 20th October 1914.]

This report is chiefly occupied with pests of cacao, the most important ones being three Capsid bugs, *Sahlbergella singularis*, Hag., *S. theobroma*, Dist., and the cacao *Helopeltis* [*H. bergrothi*, Reut.]. The eggs of *S. singularis* appear to be generally deposited in woody tissue and may be laid in branches as large as 1½ inches in diameter, occasionally in herbaceous stems and leaf stalks. In the case of *S. theobroma* the nymphs appear in 14 days, but *S. singularis* appear to require three weeks. The nymphal period occupies about a month and there are five moults. As a rule these insects do not feed during the day and avoid sunlight. Feeding generally begins about 5.30 p.m., but in dull and wet weather somewhat earlier, and if the morning be sunless they may be found at work as late as 10 a.m. When not feeding they remain quiescent on the branch, sometimes in groups of as many as 13. Isolated specimens are to be found scattered over the tree, hiding in crevices of the bark and at the base of shoots which have withered as a result of their attack at an earlier date. Adults live two or three months and breed on cacao throughout the year. No other host plant has yet been found. The chief damage is done to plants from three years of age upwards. Young branches present a somewhat gnarled appearance when attacked and, especially in dry weather, the leaves wither and the branches are easily broken by the wind. In damp weather very few branches are broken and the presence of the pest is overlooked until severe damage has been done. The epidermis dries up round each puncture in a few days and splits open, and various saprophytic fungi appear on the surface of the invaded area. When older branches have been attacked the bark does not always split, and it is only by cutting into the bark of unhealthy trees that the effect of these insects is seen by the *brown* dead cortex. (This brown tissue must be distinguished from the claret or purple colour caused by "wet" canker.)

Natural control is assisted by lizards and spiders which have been found to prey upon these bugs, and there is some evidence for thinking that the red tree ants, *Oecophylla*, also destroy them. In two cases, the larvae of an unidentified dipterous parasite were bred from this pest. A white fungus may play an important part in the natural

control. Though it has only been found on one occasion, it is very destructive to the insects when introduced into breeding cages. Insects infected with this fungus left their group and probably many fall to the ground when attacked in nature and escape notice.

Artificial control includes very careful attention to the keeping clean of plantations and spraying with kerosene emulsion as soon as the bugs are seen.

The grey moth borer, *Characoma stictigrapta*, Hamp., confines its attention solely to the pods. The eggs are laid near the stalk of the pods and frequently at the point where two or more pods are in contact. The larvae feed for a time on the surface of the pod, eventually burrowing and attacking the inner fruit walls, and occasionally the seeds. The larval stage probably lasts a month. The grey-white cocoons are to be found hidden under the excrement on the surface of the pod and on the branches. The pupal stage lasts 14 days. The actual damage done by the borer is not of economic importance, but there is serious danger of fungus infection in the wounds it causes. *Adoretus hirtellus*, Castn., has not caused serious damage during the year.

"Cacao Mosquito," which term has been adopted as a vernacular name for the *Helopeltis*, was first recorded by Dudgeon in 1909, and was thought to be nearly related to *H. schoutedeni*, Reut., from the Belgian Congo (see *Bull. Entom. Research*, i, p. 59). It is now reported to be steadily increasing and to be doing considerable damage. The eggs hatch in 14 days and the nymphs begin feeding at once and continue to feed upon the young leaves, soft stems or cacao pods (according to the position in which the egg was originally laid) for about a month. Five moults occur before the winged stage is reached. The length of the adult stage is not known, but specimens have lived upwards of 70 days in cages on cacao pods. From experiments, the author has found that the "cacao mosquito" is able to live for at least seven days upon a great variety of plants, including cacao, guava, peppers, *Solanum* spp., *Physalis* spp., mango, pomegranate, breadfruit, jackfruit, Canary banana, sweet potato, tea, yam, avocado pear, and many others. The Gold Coast cacao *Helopeltis* seems, therefore, to have a much wider range of food-plants than the Ceylon tea species, *H. antonii*. The insect failed to live upon coco yam (*Colacasia*), tobacco, coffee, papaw and *Clerodendron* sp. As the *Helopeltis* breeds at Aburi during the harmattan season, it may be concluded that there is no hibernation. At Aburi the only natural enemy found to control the pest are Mantid nymphs. Artificial control measures include such farm operations as entail the maximum amount of disturbance to the insects, the removal of food-plants other than cacao, collection of the insects and spraying with contact poison, e.g. kerosene emulsion, and lastly, the breeding and distribution of effective natural enemies. The Ceylon method of sending coolies into the cacao plantations armed with sticks smeared with the viscid sap of the Jack tree, might be useful, as an expert operator will catch as many as 1,500 insects per diem. Smearing the pods has been tried on the Gold Coast, but without much success.

The chief insect enemies of the coconut industry in the Colony, which is as yet in its infancy, are the palm weevil, *Rhynchophorus phoenicis*, and the coconut scale, *Aspidiotus destructor*, Sign. The latter pest

does not seem to make headway, probably owing to the moist atmospheric conditions assisting the spread of the red-headed fungus, *Sphaerostilbe coccophila*. The fruit fly attacking the testa of the kola fruits, *Ceratitis colae*, Silv., sometimes damages as much as 60 per cent. of the crop. It is parasitised by the Chalcid, *Tetrastichus giffardii*, Silv. Kola has also been attacked by a species of *Psylla*, perhaps identical with that which is found on cacao. The branches of the trees are often tunnelled by the larvae of a Cerambycid beetle, *Phosphorus virescens*, Oliv. These were readily controlled by cutting away badly infested branches or by destroying the borer *in situ*.

The larva of a small Chrysomelid beetle has done considerable damage to the young shoots of orange trees. The adult feeds upon the leaves and the larvae bore into the stems.

Cucumbers, melons and vegetable marrows are greatly damaged by flies of the genus *Dacus*, *D. bipartitus* being the species concerned in Aburi. The only recorded host plant appears to be a wild cucurbit, *Momordica* sp., in which it does not make much headway. The leaves should be sprayed with a sweet arsenical and the developing fruits protected with paper or muslin bags.

Coffee is said to have suffered from the attacks of two Bostrychids and one Cerambycid, and sweet potatoes at Aburi are seriously attacked by a weevil, *Cylas formicarius*.

Kvaratzchelia (T. K.). **Доходная култура орѣховъ.** [The profitable cultivation of nuts.]—No. 8 of "Garden Library" supplement to *Progressive Fruit-Growing and Market-Gardening, Petrograd*, 1914, 24 pp.

In this booklet, which gives general information on the cultivation of nuts, the insect pests, especially those injurious to species of *Corylus* are dealt with. Important injury is done by *Balaninus nucum*, the females of which bore through the still soft shell of the nuts and deposit one egg in each. The date of oviposition depends on the locality, but is generally during May and June. The larvae feed on the kernel and in August they bore through the hard shell, and pass into the earth, where they pupate and hibernate, producing the next generation in the following May. Remedies include shaking down the weevils on to cloths spread under the trees and destroying the pupae by digging. The larvae of *Oberea linearis* attack the shoots and buds; besides shaking down the beetles, the damaged shoots and buds should be cut off and destroyed during the first half of summer. The larvae of *Apoderus* (*Attelabus*) *coryli* live in the rolled-up leaves. The leaves and shoots of *Corylus* are also damaged by the beetles, *Haplocnemia nebulosa*, *Anobium brunneum*, *Phyllopertha horticola* and *Cryptocephalus coryli*, and by the moths, *Aegeria* (*Sesia*) *tipuliformis*, *Cnephasia minorana*, and *Cydia* (*Carpocapsa*) *amplana*. The caterpillars of the last-named live inside the nuts, doing great damage. The male flowers are damaged by the caterpillars of *Ancylis mitterbacheriana* and by the larvae of *Contarinia* (*Cecidomyia*) *corylina*. The buds are also attacked in autumn by *Eriophyes coryli*, causing them to swell; these mites winter inside the damaged buds. The walnut, *Juglans regia*, L., is attacked by a species of *Cydia*.

# NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

# CONTENTS.

## CONTENTS—*continued.*

VOL. II. Ser. A. Part 12—pp. 673-720. DECEMBER, 1914.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.



LONDON:

SOLD BY

DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 9d. net.

*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

PARROTT (P. J.). **Some Considerations on Protection of Orchards from Insects.**—*Proc. 59th Ann. Meeting, Western New York Hortic. Soc., Rochester,* 28th–30th Jan. 1914, pp. 110–118, 5 figs. [Reprint received 9th Nov. 1914.]

Advice as to the best means of protecting orchards from insects is here given, as the result of recent spraying investigations. Insect eggs are less resistant to insecticides than has hitherto been supposed, and those of *Psylla pyri* are among the most susceptible; common oil emulsions and miscible oils do not affect them, but eggs about to hatch, as well as newly emerged nymphs, are susceptible to lime-sulphur mixture; the solution, testing 32-34° B., diluted 1 part to 8 or 9 of water, should be used liberally, preferably in May, when *P. pyri* and *Aspidiotus perniciosus* can be destroyed by the same spraying. *Cacoecia* (*Archips*) *argyrospila*, the fruit-tree leaf-roller, though exceptionally resistant to the usual spraying mixtures, is vulnerable in its egg stage to the commercial miscible oils; 96 per cent. of the egg-masses were destroyed in tests in which 1 gallon oil to 15 gallons water were used. Sulphur sprays and various lime washes are most effective insecticides, but for Aphid eggs they are unsatisfactory, and a mixture of tobacco extract and soap, before the leaves are curled, is preferable. Alkaline polysulphides used against the San José scale were effective in the following order: Barium, calcium, sodium, potassium; they were useless for light infestations, for plant-lice and for various species of caterpillars, nor were they as uniformly effective as the lime-sulphur solution commonly used. Combined with lead-arsenate, all the polysulphides were poisonous to caterpillars, but damaged the foliage of apple, pear, peach and potato, especially in the case of the sodium and potassium preparations.

Against tree-hoppers in apple orchards, which, especially *Ceresa bubalus*, are very injurious, clean culture during the summer is the best preventive measure. Though the San José scale is subject to the attacks of five species of internal parasites and of two Coccinellids, *Rhizobius ventralis* and *Chilocorus bivulnerus*, Muls., not more than 36 per cent. of parasitism has been observed, and therefore spraying with lime-sulphur cannot be dispensed with.

PARROTT (P. J.) & FULTON (B. B.). **Tree-crickets injurious to orchard and garden fruits.**—*New York Agric. Expt. Sta., Geneva,* Bull. no. 388, May 1914, pp. 417–461, 10 pls., 9 figs. [Received 14th December 1914.]

This is an account of the life-history, habits, etc., of the snowy tree-cricket, *Oecanthus niveus*, De Geer, the narrow-winged tree-cricket, *O. angustipennis*, Fitch, and the striped tree-cricket, *O. fasciatus*, Fitch (*nigricornis*, Walker), which are the most injurious species attacking bush and tree fruits in New York, in which State *Oecanthus exclamationis*, Davis, *O. quadripunctatus*, Beut., *O. pini*, Beut., and *O. latipennis*, Riley, also occur. During their early nymphal stages the tree-crickets have pronounced predaceous habits. As they approach maturity they become phytophagous or mycophagous, subsisting on flowers, foliage, fruit and minute fungi. Eggs are deposited during the latter part of August and throughout September, but do not hatch until the following June; there are five nymphal instars and the adults appear in August.

(C98) P.86/57. 1500. 12.14. B.&F.Ltd. Gp.11/3. 

*O. niveus* oviposits on many different plants, mostly on apple, plum and cherry, less commonly on raspberry and walnut. This species subsists on a great variety of animal and vegetable foods. Microscopical examinations of crop contents have shown that, in addition to other insects, the San José scale may under certain conditions form a large part of the diet of this cricket. It has also been observed to eat holes in raspberry and apple leaves, and is said to attack ripening fruits. It derives its reputation as an orchard pest chiefly from the occurrence of diseased areas about the wounds made by oviposition in the bark of apple trees. These areas in external appearance resemble stages of the common apple cankers. *O. angustipennis* has similar habits and is common in apple orchards, and has also been observed in considerable numbers on alders, scrub and burr oaks. As with *O. niveus*, various bark disorders may attend oviposition in apple trees. *O. fasciatus* (*nigricornis*), unlike the preceding species, prefers plants which have a central pith surrounded by an outer woody layer, and it oviposits mostly on raspberry, blackberry, *Erigeron canadensis*, and the larger species of *Solidago*. The eggs are placed in a series, forming a single row, in the current year's growth. This species feeds on the anthers and petals of flowers, raspberry leaves and fruit; leaf tissues, fungus mycelium and spores constituted a large part of the crop contents of a number of specimens examined. Considerable injuries arise from the long series of punctures which it produces in the canes during the process of egg-laying. As a result of the rupturing of the woody tissues, the cane splits at the point of injury and eventually breaks.

The tree-crickets of the genus *Oecanthus* are subject to the attacks of a number of natural enemies, the most common and efficient of these being egg-parasites, of which three species belonging to the CHALCIDOIDEA and five to the PROCTOTRUPIDAE are known. Probably most of these were reared from the eggs of *O. fasciatus* or possibly *O. quadripunctatus*. The authors have reared both the Mymarid, *Polynema bifasciatipenne*, Girault, and the Proctotrupid, *Cacus oecanthi*, Riley, from eggs of *O. fasciatus* in raspberry. A Dipterous larva was found in a specimen of *quadripunctatus* in the fifth nymphal instar and occasional examples of crickets parasitised by a species of *Mermis* have been noticed.

Cultivation to destroy foreign vegetation, such as weeds and brush, and to keep the ground about trees and vines clean is an efficient measure for the prevention of damage. While the susceptibility of these insects to arsenicals has not been conclusively demonstrated, it is believed that the numbers of the tree-crickets are reduced by summer applications of these poisons. Raspberry canes showing extensive oviposition should be removed in winter or the spring prunings burned to destroy the eggs contained in them.

BRITTAIN (W. H.). **Report from the Okanagan District: Insect Pests of the Year.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 4, N.S., January 1914, pp. 14–19. [Received 17th November 1914.]

The following were some of the more important pests during 1913:—From larvae resembling those of the true bud-moth, *Eucosma* (*Tmetocera*) *ocellana*, three distinct species of moths were reared, and it is

possible that one of these is responsible for the twig-boring habits which have been repeatedly observed in British Columbia, but not elsewhere, and which were attributed to larvae of *E. ocellana*. The larvae of *Orgyia antiqua* were unusually numerous in orchards, but are only of minor importance as fruit pests. A large number of tent-caterpillars, *Malacosoma* spp., which appeared in the spring, were practically exterminated before reaching maturity by their parasites and by a bacterial disease. One outbreak of *Cydia pomonella* occurred, though not in the same orchards as the previous year, but the lesser apple-worm, *Enarmonia prunivora*, was unusually abundant, and seems to be increasing. Examination of attacked apples proved that about 60 per cent. had been entered from the side, the larvae in most cases being visible in shallow borings just beneath the skin. The fall web-worm, *Hyphantria cunea*, was very common on apple and wild cherry trees, while the red-humped apple-tree caterpillar, *Schizura* (*Oedemasia*) *concinna*, did considerable damage to apple-tree foliage. *Datana ministra*, the yellow-necked apple-tree caterpillar, was responsible for the almost entire defoliation of a large number of young apple trees, and the imported currant-borer, *Aegeria tipuliformis*, did noticeable damage in a few places. *Sanninoidea exitiosa* is a serious enemy of the peach in southern Okanagan; elsewhere in the North-west *S. opalescens* is the common form. The plum and apple sphinx, *Hyloicus* (*Sphinx*) *drupiferarum*, will often strip a young tree of all its leaves in a very short time, but parasites prevent widespread damage by this pest. A cicada, probably *Platypedia putnami*, appeared in large numbers and was responsible for a certain amount of damage to apple trees by ovipositing in the twigs, and *Cacoecia* (*Archips*) *cerasivorana*, the cherry tree tortrix, was very common on choke-cherries, but also was found occasionally on apple-tree foliage. The fruit tree leaf-roller, *Cacoecia* (*Archips*) *argyrospila*, damaged apple-trees, and the oyster-shell scale, *Lepidosaphes ulmi*, caused considerable loss in old, neglected orchards. *Aspidiotus ostreaeformis*, the European fruit scale, was not seriously injurious. The egg-blisters of *Empoasca mali*, the apple leaf-hopper, were abundant in the spring, most commonly in one-year-old wood, rarely in older wood, one or two eggs being found in each blister. Twenty per cent. of the eggs were parasitised by a small Hymenopteron. The young hoppers began to emerge on 9th May; two distinct broods of this pest occur in the Okanagan. Leaves attacked by *E. mali* are rarely curled as described elsewhere, but become mottled with whitish or yellowish spots, the fruit being marked with small, white circular marks about $\frac{1}{8}$-inch in diameter. The tarnished plant-bug, *Lygus pratensis*, was noted attacking a wide range of crops, especially nursery stock. Slight loss resulted from the attacks of the green apple-aphis, *Aphis pomi*, but the rosy aphis, *A. sorbi*, was found for the first time and may be expected to cause trouble in the future. The woolly apple-aphis, *Schizoneura* (*Eriosoma*) *lanigera* (*americana ?*), is growing in importance as a fruit pest, older more or less neglected orchards suffering severely; the root form is sometimes found in the Okanagan. Elm leaves were badly attacked by the elm-leaf louse, *E. americana*, and the currant aphis, *Myzus ribis*, was very common on currants, as was *Epochra canadensis*, the currant fruit-fly. The black cherry-aphis, *M. cerasi*, the most important pest of the cherry, was fairly abundant, and a common insect

pest of the plum was *Hyalopterus arundinis*, the mealy plum-aphis, while cabbages and turnips were injured by *Chortophila brassicae*. The fruit-leaf beetle, *Syneta albida*, was reported as damaging strawberries and clover and no method of controlling it has been found [see this *Review*, Ser. A, i, p. 413]. The flea-beetle, *Epitrix subcrinita*, fed freely on tomatoes, potatoes and various weeds, and the bronze apple-borer, *Magdalis aenescens*, was commonly found boring into the injured wood of apple-trees. The most common and injurious Elaterid is *Corymbites inflatus*, but in the spring a very severe infestation of *Cardiophorus fenestratus* occurred ; other species occurring in orchards in the Okanagan are: *Corymbites morulus*, *C. fallax*, *C. maurus*, *C. furtivus*, *C. conjungens*, *C. aeripennis*, *C. cruciatus*, *C. triundulatus*, *Cardiophorus tenebrosus*, *C. tumidicollis*, *Elater nigrinus*, *Dolopius lateralis*, *Limonius pilosus* (*infuscatus*), *L. discoideus*, *L. venablesi* and *L. canus*. The grey leaf-beetle, *Glyptoscelis pubescens* (?) is present in abundance in the spring, feeding mainly on *Balsamorrhiza sagittata*, but occasionally on apple foliage. *Hylemyia antiqua* (*Pegomyia ceparum*) the onion maggot, was fairly common, and onions were also attacked by the hyacinth mite, *Rhizoglyphus hyacinthi*, which had in many cases burrowed deep into the root. Red spider, *Tetranychus bimaculatus*, was responsible for more damage than the almond mite, *Bryobia pratensis*, and in a few isolated cases *Eriophyes pyri*, the pear-leaf blister-mite, severely injured pears, but has never been found attacking apple-trees in British Columbia. The rusty-leaf mite, *Phyllocoptes schlectendali*, Nalepa, feeds upon the upper surface of the apple leaves ; in some cases, attacked leaves are of a red rusty colour, but more often have a silvery appearance which is invariably confused with the disease called "silver-leaf." In the case of "silver-leaf," however, the entire leaf is uniformly silvered, with a milky gloss, while when the attack is due to the mite, it is usually more or less patchy, with a metallic lustre ; a very bad attack of *T. bimaculatus* frequently produces a sheen on plum leaves. A mite, considered by Dr. Banks to be probably *Eriophyes malifoliae*, was found hidden in the pubescence on the under-side of apple leaves, and when present in large numbers the entire leaf may wither and turn brown, the work often being mistaken for apple scab.

TREHERNE (R. C.). **Report from Vancouver District: Insects Economically Important in the Lower Fraser Valley.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 4, N.S., January 1914, pp. 19–33. [Received 17th November 1914.]

This paper records the results of the past two seasons' observations on the insects of economic importance occurring in the Lower Fraser Valley. *Eucosma* (*Tmetocera*) *ocellana*, Schiff., the eye-spotted bud-moth, ranks first among the insect pests of the apple in the Fraser Valley ; *Enarmonia prunivora*, Walsh, occurs, but its life-history under local conditions is but imperfectly known. A leaf-roller of the genus *Olethreutes*, which resembles the bud-moth in habits, has been observed in small numbers, and in recent years the fall web-worm, *Hyphantria cunea*, Dru., the tent caterpillar, *Malacosoma erosa*, Stretch, and the apple fruit-miner, *Argyresthia conjugella*, Z., have been less common. No occurrence of the cherry fruit-fly, *Rhagoletis cingulata*, Lw., has

been recorded in Canada since 1906, when it injured cherries at Victoria, B.C. *Aphis* (*Siphocoryne*) *avenae*, F., the European grain aphis, occurs commonly on the apple, often in association with *A. sorbi*, on the leaves in spring, whence it migrates to grains and grasses in the summer, to return to the apple in autumn. The apple aphis, *Aphis pomi*, L., the cherry aphis, *Myzus cerasi*, L., the oyster-shell scale, *Lepidosaphes ulmi*, L., and the red-humped apple-tree caterpillar, *Schizura concinna*, S. & A., are all fairly common, as well as the cigar case-bearer, *Coleophora fletcherella*, Fern., which cannot, however, be classed as an important orchard insect. The first larval brood, in June, of the pear-slug, *Eriocampoides limacina*, Retz., may cause injury, but can be combated with arsenate of lead or pyrethrum powder; the second brood of larvae, in August, can almost be classed as advantageous, for the defoliation checks the growth and assists the tree to ripen its wood for the winter. The economic importance of *Syneta albida*, Lec., is uncertain, while *Magdalis aenescens*, Lec., the bronze apple-tree weevil, is scarcely of economic importance. Other pests referred to in this report are the pear-leaf blister-mite, *Eriophyes pyri*, Pagnst., the apple leaf-hopper, *Empoasca mali*, Le B., the strawberry-root weevil, *Otiorrhyncus ovatus*, the black vine-weevil, *O. sulcatus*, Cercopidae, the currant-borer, *Aegeria tipuliformis*, Clerck, the currant fruit-fly, *Epochra canadensis*, Loew, the potato flea-beetle, *Epitrix cucumeris*, Harris, the red turnip-beetle, *Entomoscelis adonidis*, F., the cabbage maggot, *Chortophila* (*Pegomyia*) *brassicae*, Bouché, the imported cabbage worm, *Pieris* (*Pontia*) *rapae*, L., the cutworms, *Peridroma saucia*, Hb., and *Hadena* (*Eupsephopactes*) *procincta*, Grt., the onion maggot, *Hylemyia antiqua* (*Phorbia cepetorum*, Meade), the chrysanthemum leaf-miner, *Napomyza* (*Phytomyza*) *chrysanthemi*, Kowarz, the tarnished plant-bug, *Lygus pratensis*, L., the bulb-mite, *Rhizoglyphus hyacinthi*, Boisd., the narcissus-fly, *Merodon equestris*, F., and the oblique-banded leaf-roller, *Cacoecia* (*Archips*) *rosaceana*, Harr. A table summarising the essential times for spray application to apples in the Lower Fraser Valley is also given.

Engelhardt (V. M.). **Новыя работы по гнильпу.** [New work on foul-brood.]—**«Русскій Пчеловодный Листокъ.»** [*Russian Beekeeping Gazette*,] *Moscow*, 1914, nos. 1–6, January–June 1914, pp. 12–16, 46–49, 84–86, 126–130, 162–165, and 195–200, 6 figs.

This is part of a paper on "foul brood," read at the seventh All-Russian Conference of Beekeepers at Kiev, dealing with the pathological changes provoked by the disease in the internal organs of the larvae of bees. Investigations were conducted only on diseased larvae which were still alive, i.e. showed some signs of movement when touched by a needle or forceps. This method enabled the changes undergone by the cell elements of individual organs to be observed, and from these to argue the state of the organ as a whole and that of the general condition of the diseased larvae. Larvae infected with *Bacillus alvei* were chiefly experimented with, although occasionally

other forms of the disease, such as dry foul brood, as well as cases of mixed infection were found. A general description of the characters of healthy larvae before infection, especially as regards histological structure of internal organs is given. Special attention is given to the histology of the alimentary tract, in as much as observations show that it is chiefly in the mid-gut that the concentration and development of the bacteria causing the disease take place. The author agrees with Serbinov and other investigators that infection can only be effected through the food. The mere presence of the bacteria or their spores in the food is not sufficient to produce infection, which requires further favourable conditions, such as a sufficient number of germs, unseasonable weather and an enfeebled state of the hive. An explanation is thus afforded of the fact that it is not always possible artificially to infect larvae from pure cultivations of foul brood. The incubation period does not in any way affect the outward appearance of the larvae and there are no means of judging of the progress of the disease except by cultivating or staining the contents of the gut. Seriously infected larvae cease to feed and change their position, lying fully extended instead of being curled round in the cells; their movements become sluggish and their colour changes. Neither smell nor colour of the diseased larvae can be used as a test for foul brood, as both vary greatly under different conditions and only bacteriological investigation of those still alive can give a true diagnosis of the disease. The author is inclined to doubt the accuracy of the statement of Maassen, that the bees are able to remove the larvae which have died from European foul brood from the cells, as the dried up larvae fill the cell completely and even become adherent to its walls and bottom. He also does not agree that in every case of foul brood there is a mixed infection; in all cases of European foul brood investigated by him, there was present only *B. alvei*. He refers also to another form of foul brood, discovered by Serbinov, which he attributes to an Actinomycete which he named *Actynomus apis*. The author has also frequently come across cases of apparently typical foul brood, in which all the inner organs of the larvae were penetrated with fungus mycelium and in which neither *B. alvei* nor *B. brandenburgiensis* were found. He also observed one case of dry or sour foul brood due, according to Howard, to fungi of the genera *Aspergillus* and *Penicillium*. In this case, in addition to the fungus mycelium, enormous numbers of *B. alvei* were also present; the digestive organs showed the results of the activity of *B. alvei* and the fungus was also concentrated in this part and from there had spread over the whole body, penetrating all the organs and passing through the chitin. No matter by what bacteria foul brood is brought about, it is always a disease of the digestive organs of the larvae, accompanied by an increased discharge of secretions; later on, the course of the disease depends on the bacteria, *B. alvei* attacking chiefly the mid-gut and partly the fatty tissues, while *B. brandenburgiensis* attacks mainly the latter.

The most effective remedies against foul brood seem to be:—the driving of the bees into a new hive, the change of the queen bee, and the addition of $\beta$-naphthol to the food, or spraying with and adding a little 10 per cent. formic acid to the food. All these and other remedies, however, only delay the development of the bacteria and do not kill them.

Kleine (R.). *Chrysomela fastuosa*, **L., und ihre Nahrungspflanzen.** [*Chrysomela fastuosa*, L., and its food-plants.]—*Entom. Blätter, Berlin*, x, nos. 3–4, 5–6 & 7–8; 15th March, 11th May & 11 July 1914, pp. 110–117, 146–148, 202–206, 9 figs.

This is an account of an extensive study of the Labiate food-plants of *Chrysomela fastuosa*, L., made in the endeavour to establish some relationship between the genus *Chrysomela* and its food-plants. The paper is incomplete, further issues of the publication not having come to hand from Germany.

Topi (M.). **Osservazioni e ricerche sulle Tignuole della Vite.** [Observations and researches on vine moths.]—*Atti R. Accad. dei Lincei, Rome*, (5) xxiii, semest. I, fasc. 2, 21st June 1914, pp. 981–988; semest. II, fasc. 1, 5th July 1914, pp. 15–18.

The question of the sites of hibernation of *Clysia* and *Polychrosis* is of great importance in the struggle against these pests. French observations are very valuable, but there is a condition in the vineyards in Italy which does not exist in France, namely, the use of canes as supports for the vines, the top of an internode of which affords an excellent shelter for the pupae. According to the size of the vine, six to twelve canes may be used, and though not all are cut so as to leave the top internode open, this is the case in the majority of them. Further, the vines are allowed to grow tall and each will have from two to three feet of old wood, in the rough bark of which the larvae pupate. The rasping of the old bark and the careful cutting of the tops of the canes are therefore elementary but necessary precautions. Spraying the stocks with boiling, or at least very hot, water is really only useful against *Sparganothis pilleriana*. On 20 vines examined 19 pupae were found in the canes and 18 under the bark, and only six vines yielded no pupae; a further and larger series of observations gave much the same result, namely, about equal numbers of pupae in the cane and under the bark. The canes also shelter Hymenopterous parasites; out of 100 pupae so collected, 57 yielded moths, 22 were parasitised, and the remainder were attacked by fungi or were empty. In the tips of the canes were found a Tenebrionid of the genus *Helops* and the larva of a Melyrid beetle, *Malachius bipunctatus*, which are regarded as preying on the pupae, but there is some doubt on this point, as healthy pupae were frequently found associated with these insects and when kept together under glass the pupae were not attacked. Of the 57 imagines above referred to 54 were of *Polychrosis* and only three *Clysia*. In fermentation traps, the proportion was different, viz., 73 *Polychrosis* and 10 *Clysia*. *Clysia* was observed to be specially abundant in certain restricted areas and in some places to the complete exclusion of *Polychrosis*. Results of further investigations are given as to the value of bait traps, the dates of emergence, and the relative proportions of *Clysia* and *Polychrosis*. A vineyard of about one acre in area in the midst of other vineyards was selected for experiment; four glazed earthenware vessels were set up as traps and filled about half full with a mixture of wine lees, molasses and water, the loss by evaporation being made up every three or four days. From July 9th to August 5th, 83 moths were taken,

only 10 of which were *Clysia*; other insects included many Cerambycids, chiefly *Aromia moschata* and *Purpuricenus koelheri*, great numbers of *Cetonia*, a few *Chrysops* and only two *S. pilleriana*. It is argued that fermenting liquids are the most attractive baits, but that to be of any real use the number of traps must be very large and the cost high, but if generally practised, the method would be of the greatest value as giving reliable information on which to base the date of spraying operations with a view to preventing oviposition.

RUSSELL (H. L.). **Report of the Director, 1913.**—*Wisconsin Agric. Expt. Sta., Madison*, Bull. no. 240, June 1914, 98 pp., 54 figs. [Received 4th December 1914.]

The cottony maple scale was very destructive in some areas in the southern part of the State on soft maple trees; generally, the native parasites hold this pest in check after one year of abundance. Cutworms caused tremendous losses at a few points, and more or less damage everywhere. A poison bran mash made by mixing 1 lb. Paris green with 40 lbs. dry bran, and moistening this with two quarts of cheap molasses and water to a stiff paste, will be effective against cutworms, if scattered about the infested spots in the evening. The ravages of the onion thrips, *Thrips tabaci*, as well as of the larva of the onion fly, *Hylemyia antiqua*, have in late years become so pronounced as now to threaten this crop with destruction. Trials conducted by Dr. H. H. Severin with a sweetened poison-bait spray against this fly indicate that the trouble can be considerably checked, but additional trials will be needed to see if the mature flies can be destroyed before oviposition begins. The spray consists of: $\frac{1}{4}$ pint common "black-strap" molasses added to a gallon of water with one gram of sodium arsenite. Both sexes are readily attracted, and are killed within three to ten hours after ingestion of the poison. Careless culture undoubtedly hastens the rapid spread of this pest, and onion refuse, consisting of tops, undersized bulbs, etc., should on no account be left on the field or spread on it and dug in as manure. The San José scale has occurred in a few new localities, but immediate measures succeeded in exterminating it before it spread.

I. B. S. **Zum diesjährigen Mottenflug.** [Concerning this year's vine moth flight.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 13, 1st July 1914, pp. 207–208.

Five moth traps, set in a vineyard in the severely infested district of Kleinmacher in Luxemburg, captured 498 *Clysia ambiguella* in the 24 days of the flight in May and June. The bait consisted of equal parts of water sweetened with sugar, old beer and old cider, and was replenished every 2 or 3 days. The odour of nicotin drives the moths away, and spraying with nicotin caused an instant drop in the catches, the weather remaining unchanged. Though useless on cold and rainy days, traps are valuable in severely infested districts and, given suitable weather, a total catch of 150 moths per trap during the flight is certain, or 45,000 for 300 traps, which is the number one man can attend to in a day.

Sergent (E.) & Lhéritier (A.). **Essai de destruction des Sauterelles en Algérie par le** *Coccobacillus acridiorum* **de d'Hérelle.** [Trials in locust destruction in Algeria by the *Coccobacillus acridiorum* of d'Hérelle.]—*Bull. Soc. Nat. d'Acclimat., Paris,* lxi, no. 14, 15th July 1914, pp. 456-467.

As a result of these first trials in locust destruction in Algeria by *Coccobacillus acridiorum*, the following conclusions are reached: (1) The power of the virus may be increased until it becomes capable of killing *Stauronotus maroccanus* in 4 hours on an average. (2) Groups of *Stauronotus* were infected by spraying the nocturnal resting places with *Coccobacillus* cultures; a heavy mortality followed such spraying, after an incubation period of a few days. (3) In this short trial the infection spread but slightly to other groups which adjoined the infected one [see this *Review*, Ser. A, ii, p. 238–239].

Arnal (A.). **Préparation des bouillies cupriques mouillantes et adhérentes par l'addition de caséine.** [The preparation of wetting and adherent copper sprays by the addition of casein.]—*Rev. Maladies des Plantes, Paris,* ii, no. 2, 15th July 1914, pp. 9–10.

So-called "soluble caseins" have been put on the market to overcome the difficulty that sometimes occurs when preparing Bordeaux and Burgundy sprays, which must be alkaline, with ordinary casein. The quantity of soluble casein for 30 gallons of spray costs $2\frac{1}{2}$*d.*, the cost of ordinary casein being 1*d.* For Bordeaux spray, $4\frac{1}{2}$ oz. of soluble casein are dissolved in $22\frac{1}{2}$ oz. of hot water until a sticky paste is obtained, to which $1\frac{3}{4}$ pints of milk of lime are slowly added with constant and vigorous stirring. This mixture is then poured into 30 gallons of alkaline Bordeaux spray. In the case of Burgundy spray (alkaline) the milk of lime is replaced by $1\frac{3}{4}$ pints of a 10 per cent. solution of carbonate of soda.

P. F. **Bekämpfungsversuche des Heuwurms mit chemischen Mitteln während 1914.** [Experiments in the chemical control of the first generation of *Clysia ambiguella* during 1914.]—*Luxemburger Weinztg., Grevenmacher,* ii, no. 14, 15th July 1914, pp. 218–222.

The results achieved in controlling the first generation of *Clysia ambiguella* with the seven insecticides officially adopted in Luxemburg [see this *Review*, Ser. A, ii, p. 538] are tabulated. Infestation was only slight this year, so that no definite conclusions could be reached, but in every case treatment decreased the number of larvae. Scorching occurred wherever treatment was applied. It was usually slight in character, though there were some instances of severe injury. This difference is due to the weather, to the cultural conditions of the vines and to the varying time of day when control was applied. The least injury was caused by Laycotin, Laymann's nicotin powder, and the three formulae of tobacco extract solution. The first of these contained $1\frac{1}{2}$ per cent. of tobacco extract (10 per cent. nicotin), 1 per cent. of copper sulphate, 1 per cent. of lime, and $\frac{1}{2}$ per cent. of soap. The other two formulae were identical, except that the soap was omitted in one of them and the copper sulphate in the other. "Schachenmuhle" nicotin, Golazin-Itötsi, Conchycid, and Muth's emulsion

injured the plants severely in some instances. This year the vines appear to have had little power of resistance, as scorching was noticed in localities where weak Bordeaux mixture was used. Control was hampered by continued bad weather, in consequence of which the flight of the moths was prolonged. To spray 100 stocks, 20 pints of solution were required on an average, the usual time necessary being 67 minutes. In one case, where the leaves were also sprayed, about 58 pints of solution were used in 90 minutes. On an average, 4 lb. of powder and 12 minutes time were necessary for dusting 100 stocks. The local cost of the various insecticides is given.

P. F. **Zur geschmacklichen Beeinflussung der Moste und Weine durch die Wurmbekämpfung mit Nicotin.** [The effect of nicotin used against *Clysia ambiguella* on the taste of musts and wines.]—*Luxemburger Weinztg., Grevenmacher,* ii, no. 14, 15th July 1914, pp. 228–230.

The opinions of several authorities are quoted with regard to whether musts and wines acquire any special flavour from the nicotin spray used against *Clysia ambiguella.* It is agreed that a carefully prepared spray, applied at the proper time, communicates no such taste, at any rate when copper sulphate is nearly or entirely absent. The spray solution should therefore contain only nicotin and soap.

Zschokke (A.). **Versuche über Heuwurmbekämpfung.** [Experiments in the control of the first generation of *Clysia ambiguella,* Hbn.] —*Weinbau der Rheinpfalz, Neustadt a. d. Hdt.,* ii, no. 17, 15th July 1914, pp. 186–196.

The chemical control of *Clysia ambiguella,* Hbn., is dealt with, the results of experiments on 66 plots, in the spring of 1914, being given. Uniform results are not possible in a big vineyard, as spraying takes time and the larvae grow rapidly. When cold weather interrupts the flight of the adults, the first generation becomes divided into two distinct larval periods, to control which two sprayings are necessary. This reason for the non-success that often attends spraying against the first generation, does not operate so largely in the case of the second. Bad weather may not only delay spraying until the proper date has passed, but may wash away a correctly applied insecticide. When conducting experiments the following points should be remembered: The marginal rows of stocks and the terminal stocks of each row are more severely infested than those in the centre of the vineyard, and in a very irregular manner; the different varieties of vines are not attacked in the same degree, in the Palatinate, "Riesling" suffers more than "Sylvaner"; the moths prefer the more strongly developed, thicker- and darker-leaved stocks; taller stocks suffer more heavily; vines near to or under trees are irregularly infested, sometimes more, sometimes less than other vines. The care with which spraying is conducted materially influences results. An insecticide may be non-injurious to the vine one year and do damage the next.

These factors were considered in the present experiments. Spraying mostly took place on the 19th and 20th May, 1914. To gauge the efficacy of the insecticides correctly the living larvae only were

counted, and the count was only taken after an interval of some weeks, on the 20th June. By that time the larvae are half-grown and are found in a knot of more or less eaten flowers. Such " nests " are easy to count, and though one may sometimes be empty, this is counterbalanced by the fact that occasionally two larvae are to be found in one nest. The results in the 66 plots are tabulated :—Bordeaux mixture: 2 per cent. strength was quite ineffective. Evert's tobacco extract: In all cases a $1\frac{1}{2}$ per cent. solution of this product was used. It contains a guaranteed 10 per cent. of nicotin. Used alone, the percentage of larvae destroyed was 89·9 ; with 2 per cent. Bordeaux mixture, 97·5 ; with $\frac{1}{2}$ per cent. soap, 29·8 in one case and 88·3 in another ; with 2 per cent. Bordeaux mixture and $\frac{1}{2}$ per cent. soap, 72·9. No injury to the vines or retarded ripening was noticed. Tobacco extract of the Austrian Régie : In all cases a $1\frac{1}{2}$ per cent. solution of this product was used. It contains from 9 to 11 per cent. of nicotin (9 per cent. guaranteed). When spraying on the 19th May and using 0·15 per cent. of soap the percentage of larvae destroyed was 85·4 ; with $\frac{1}{4}$ per cent. of soap, 79·1 ; with $\frac{1}{2}$ per cent. of soap, 74·3. On the 23rd May and 9th June $\frac{1}{2}$ per cent. of soap was used and the figures were 36·5 and 28·6 respectively. It will be seen that the early spraying gave good results and that the addition of varying strengths of soap did not appear to influence its efficiency. The treatment did not interfere with the vines in any way. " Excelsior " tobacco extract containing 10 per cent. of nicotin was used on the 23rd May and the result was negative, the control plot being less infested. A $1\frac{1}{2}$ per cent. solution of " Schachenmuhle " containing 10 per cent. of nicotin was sprayed on the 23rd May. In spite of the rainy weather, over 69·6 per cent. of the larvae were killed and the vines were not injured. Muth's preparation of nicotin, carbon-bisulphide, and petroleum-soap emulsion was used on the 9th June, after the larvae had developed somewhat. It destroyed 52 per cent. of the larvae and did not injure the vines ; earlier spraying might have been advantageous. " Elcotin " contains 3 per cent. crude nicotin. A 5 per cent. solution was used on the 20th May and 98·3 per cent. of the larvae were destroyed, the vines being uninjured. Crude nicotin, sprayed early, is therefore a useful control. " Rebinol " is used in a 25 per cent. solution. Spraying on the 19th May resulted in 16 per cent. of the larvae being killed, and it is therefore inferior to the cheaper nicotin preparations. " Ampelophil " was useless in these trials. " Golazin-Itötsi " contains crude nicotin, soap, crude spirit and an adhesive. A 2 per cent. solution was sprayed on the 20th May and 4 per cent. of the larvae were killed. This result is distinctly opposed to those of the previous year [see this *Review*, Ser. A, ii, pp. 239–240] and further trials are required. The former good result may have been due to action against grape-rot and stem-rot (*Botrytis*) rather than against the larvae. The treated vines were slightly scorched and growth was retarded. Dr. Ohler's preparation is an emulsion of non-poisonous alkalis and oily liquids (carbonate of soda and turpentine). Great care is necessary in thoroughly mixing the spray for use, or the turpentine may separate. Spraying took place on the 20th May and 28·6 per cent. of the larvae were killed. No injury to the vines was noticeable, but it is evidently inferior to nicotin. " Conchycid " only destroyed 10·3 per cent. of the larvae in these

trials. "Speculin" killed 42·8 per cent. of the larvae. Though this is insufficient, the cheapness of this product indicates that trials with a more concentrated solution than that of 1 per cent. strength, costing about 1*s.* 5*d.* per 20 gallons, are advisable; no damage was noticed. Besides the above tests, a number of vineyard proprietors recorded their results. They almost exclusively used the nicotin-soap mixture of the Palatine Vine-growers' Association [see this *Review*, Ser. A, ii, p. 586.] In four plots the figures were 26·9, 27·2, 46·8 and 30·5. This partial success was probably due to the wet weather. It is concluded that even the best remedies do not afford complete protection, though bad weather may be responsible in some measure for this.

**Bekämpfung des Frostspanners. Anlegung von Leimringen an Obstbäumen.** [The control of the Winter Moth, *Cheimatobia brumata*, by banding fruit trees.]—*Deutsche Obstbauztg.*, *Stuttgart*, no. 14, 15th July 1914, p. 311.

The banding of fruit trees to protect them against *Cheimatobi brumata* is the subject of a notice issued to the police forces of the district by the local agricultural authority at Hanau. The bands must be of tenacious material, about $\frac{1}{5}$ inch thick and at least $3\frac{1}{2}$ inches wide, spread on grease-proof paper. About 80 yards of paper and from 11 to 15 lb. of adhesive material must be used per 100 trees. Where the owners neglect this duty, the police will have the work done, the defaulters being charged with the cost.

Grassi (B.). **Nuovi contributi alla conoscenza delle Filloserine. Fuoriuscita dal Terreno delle Prime Larve (Neonate) della Fillosera della vite.** [Further contributions to the knowledge of Phylloxera. Exit from the soil of the primary larvae.]—*Atti R. Accad. dei Lincei*, *Rome*, (5) xxiii, semest. II, fasc. 2, 19th July 1914, pp. 19–30.

Reference is made to the work of Faucon, who, in 1868, discovered that in summer the young *Phylloxera* leaves the vine on which it was born and traversing cracks in the soil, emerges from it and, whether aided by the wind or not, reaches the roots of other vines. A brief résumé of discoveries in this connection is given. In 1913, G. Tramoni studied the question near Barletta and observed the new-born Phylloxera emerging from the soil; this process went on from September to the end of December and was limited to fissured soils, though it also occurred between the soil and the vine stock. The migration was irregularly distributed and the maximum seemed to occur about the end of September, when as many as 50 individuals might be found round one vinestock.

The migration falls off very greatly in the first week of October and after December no more was observed until May. Near Barletta the hibernating *Phylloxera* begin to move about the middle of March, the first eggs are found about 11th April and the first young about 25th April, and observations made in 1914 show that migration begins soon after the hatching of the young of the hibernated brood. The phenomenon has been observed also in sandy soil. The wandering insects shelter from the sun under anything which comes in their way,

but only for a short time. As the weather grows colder their movements become more limited and by the end of December they appear only to crawl out for warmth. These migrants, which seem to be all primary larvae, appear to have a natural tendency to mount either on higher ground or on the vine branches ; they are, under favourable conditions, carried some distance by the wind, but are so easily protected by stones, bits of earth, etc., on the surface, that this is of no real importance, though violent winds may carry away large numbers. The resistance of these larvae to heat, cold, moisture and other weather conditions has been studied. Their resistance to heat increases as the season advances and rain begins to fall. For example, in July, when the sun is hot and the soil dry, they will only survive exposure for a very short time, whereas if the soil be moist, they survive for three or four hours ; in southern Italy the dry heat causes a great diminution of migration in July and August. In those months in which the heat is not too intense and some rain falls, the danger of transport of *Phylloxera* by people working in the vineyards is considerable and it would apparently be wise not to carry out any operations in vineyards in windy weather. Winter digging, according to Tramoni, is dangerous, as the insects are carried by the spades and hoes, but this is not the case in May. Fragments of small roots bearing hibernating colonies are frequently carried on tools in winter, especially when the soil has been disturbed to some depth.

**Commercial pyridin as a vine pest control.**—*Jl. Agric. pratique, Paris*, xxviii, no. 30, 23rd July 1914, p. 129.

Commercial pyridin acts as an insectifuge against the adults of *Polychrosis botrana* and as a contact poison against the larvae. A 1½ per cent. solution is non-injurious to the vine in summer, though it may scorch the inflorescences. Its effect only lasts for two days, so that frequent applications are necessary whilst the moths are on the wing or the larvae are hatching. Black soap increases the efficacy of pyridin and the following solution is fatal to the larvae : Pyridin 2 oz., black soap 1½ oz., water 100 oz. In association with Burgundy mixture, its insecticidal value is inferior to that of nicotin. Pyridin oleate appears to have a more lasting effect, as it wets the leaves well and acts as a direct insecticide.

Semichon (L.). **Destruction des insectes et des cryptogames. Nouveaux procédés.** [New methods for destroying insects and fungi.]—*Rev. Vitic., Paris*, xlii, no. 1076, 30th July 1914, pp. 113–120.

If properly handled, purely physical forces will often give better results in pest control than the chemical agents now employed. Working on this basis, the author has been able to simplify arsenical treatment against insect pests of the vine and also to test the value of hot water treatment applied during the period of growth. In using arsenicals against *Sparganothis*, the larva is usually assumed to emerge from the bark in spring and to enter the pupal stage in June. This is not always the case, and the vine-grower who has applied treatment in April and May is surprised by fresh attacks in June and July. The various stages of *Clysia* and *Polychrosis* extend over still longer periods, so that the two usual sprayings with lead arsenate

are of little use. The number of sprayings must be increased, but lead arsenate is costly. An examination of the rôle played by the latter has led the author to discard it and to substitute sodium arsenate, of which from $4\frac{3}{4}$ to $6\frac{1}{2}$ oz., costing $\frac{1}{2}d.$ to $1d.$, were added to every 20 gallons of the Bordeaux mixture, which was sprayed five times between April and the end of June. The resulting arsenate of copper was quite as resistant to rain as the costly and doubtful arsenate of lead; it was also cheaper, even though sprayed every 12 or 14 days; it was more efficient, through being applied over a longer period; and its use allows a very dangerous substance to be dispensed with. It may sometimes happen that with the larger dose of sodium arsenate ($6\frac{1}{2}$ oz.) the spray may scorch the leaves. This is due to its being alkaline, and a slight increase of the sulphate of copper up to $6\frac{1}{2}$ oz. per 20 gallons corrects this defect. Arsenicals are ineffective against insect enemies after blossoming, and nicotin is of no greater value. Heat is better, hot water being the most convenient medium [see this *Review*, Ser. A, ii, p. 444]. In the spring the young shoots of the vine, rose, gooseberry, wild quince, peach, plum and cherry resist watering with hot water at 158°F., the slightly withered appearance disappearing on the next day. It is inadvisable to exceed this temperature where delicate tissues, such as the stamens of fruit blossoms, are concerned. In the vine, grapes resist a temperature up to 168°F. after the fruit is set, as also do the older stalks and leaves; the leaves and stalks of fruit trees also remain unaffected. The use of the ordinary knapsack-sprayers containing $26\frac{1}{4}$ pints is recommended, the plants being well watered and not merely sprayed. When dealing with a few plants, $17\frac{1}{2}$ pints of boiling water are poured into the sprayer and $8\frac{3}{4}$ pints of spring or river water at a temperature of from 59°F. to 69°F. are added, so that an average of about 160°F. results. After loss by radiation, etc., the water reaches the plant at a temperature of 149°F. on an average. When dealing with entire plots, a portable boiler is used, as in dealing with *Sparganothis*. In April, when the shoots are from 6 to 12 inches long, hot water at 131°F. will kill *Sparganothis* larvae in half a minute, and they also die if in contact with water between 140°F. and 150°F. for from 5 to 10 seconds. When the vine is more developed and *Sparganothis* begins to be present in its web, the hot water easily penetrates if the watering is a little prolonged. Both *Clysia* and *Polychrosis* yield to water at 150°F. so long as they are not inside the tissues. In any case this method will destroy large numbers of first generation larvae. So far as observed, *Clysia* and *Polychrosis* eggs aborted through the action of heat. Hot water at 150°F. destroys all the eggs it touches. This is of importance as regards the troublesome summer generations, and hot water treatment is advisable after the moths have oviposited. In nearly all cases, plants resist the action of hot water far better than their insect or cryptogamic parasites. Simultaneous treatment against insects and mildew is easily effected by using water at 160°F. containing 1 per cent. of neutral acetate of copper, and the use of hot copper solutions against mildew is most advisable on account of their great wetting power. The portable boiler used produces 120 gallons of boiling water per hour; it is supplied from a transportable barrel; an extra barrel is required for dissolving the neutral acetate of copper, and knapsack sprayers of $26\frac{1}{4}$ pints capacity are carried by the men.

**The destruction of fungus and insect pests by sulphur fumes.**—*Rev. Vitic., Paris,* xlii, no. 1076, 30th July 1914, p. 131.

In a report of the proceedings at the Congrès de Viticulture held at Lyons in 1914, M. Bacon is stated to have drawn attention to some successful experiments in the destruction of cryptogamic diseases and insects. Sublimated sulphur was mixed with starch paste to a stiff compound, which was moulded into sticks. These were dried, dipped in nicotin or formol and broken into pieces. About 6 to 8 lb. were distributed in the vineyard and set alight when the foliage was freshly watered or still wet with rain or dew. In calm weather the fumes cling to the ground, envelop the stocks and destroy the cryptogamic parasites, whilst the nicotin and formol either drive away or kill the insects.

ZAPPELLI (—). **Un' industria nuova già compromessa!** [A new industry already compromised.]—*L'Agricultura Sabina, Poggio Mirteto,* xiii, no. 7, 31st July 1914, p. 29.

The production of clover seed has had to be abandoned in most of Central Umbria owing to injury by *Apion apricans.* This industry was initiated a few years ago, and was promising well until this weevil made its appearance. The only methods of dealing with it involve the loss of the seed; either the clover may be mown and used as fodder, or the mown clover may be stacked in heaps, in which the heat generated will kill the insects.

GROVE (A. J.) & GHOSH (C. C.). **The life-history of *Psylla isitis,* Buckt. (*Psyllopa punctipennis,* Crawford), the "Psylla" Disease of Indigo.**—*Mem. Dept. Agric. in India, Calcutta,* Entom. Ser., iv, no. 6, July 1914, pp. 329–357, 6 plates.

In an account of *Psylla isitis,* Buckt., and its attacks on indigo [see this *Review,* Ser. A, i, pp. 43–46], it is stated that only indigo-yielding plants support this *Psylla,* none of the weeds which commonly grow in indigo fields serving as food-plants. Experiments in pots showed that plants well manured with superphosphate and oil cake were as readily attacked by *Psylla* as untreated ones. The infection of new areas is generally effected by flying females, which may be assisted by the wind. Indigo plants covered with wire gauze, 10–12 meshes to the inch, were unattacked, though the pest was in great numbers 5 yards away. When indigo was sown with covering crops, such as wheat, linseed and mustard, the young plants were unattacked, though neighbouring, uncovered indigo was badly affected. The nymphs seem unable to spread far, as, although they were observed to travel along the ground 5 or 6 feet or more, they died within a day if they failed to reach proper food-plants. The heavy dews of September and October check an infestation by hindering oviposition. The enemies of *Psylla* include: *Campylomma livida,* Reut., a Capsid bug, which is enabled by means of its rostrum to get at the young nymphs in hiding which are secure from other enemies, and a black spider, which mimics *Camponotus compressus,* one of the many ants always accompanying this *Psylla.*

Wichmann (H. E.). **Zoological results of the Abor Expedition, 1911–1912: Coleoptera, VII.**—*Records Ind. Mus., Calcutta,* viii, pt. v, July 1914, pp. 411–414.

During the Abor Expedition five species of *Xyleborus* were collected, of which two are described as new—*Xyleborus gravelyi* and *X. aplanatus.*

Silvestri (F.). **Zoological results of the Abor Expedition, 1911–1912: Termitidae.**—*Records Ind. Mus., Calcutta,* viii, pt. v, July 1914. pp. 425–435, 10 figs.

Eleven species of Termitidae from the Abor country are recorded here, seven being described as new.

Noel (P.). **Les Pucerons des Serres et le Tabac nitré.** [Greenhouse aphids and nitrated tobacco.]—*Jardinage, Versailles,* iv, no. 30, July 1914, pp. 401–402, 3 figs.

Greenhouse aphids invariably succumb to the following treatment: One pound of factory tobacco waste, costing about $4\frac{1}{2}$*d.*, is steeped for one hour in a cold, concentrated solution of saltpetre or nitrate of potash and then dried in the sun. From 2 to 20 lb. of this product, according to the size of the greenhouse, is placed in a flower pot in the centre of the floor and set alight in the evening after all openings have been closed. The eggs will not be affected, and a second fumigation is necessary four or five days later in order to destroy the newly hatched individuals before they have time to oviposit.

Castella (F. de). **Sulpho-Carbonate of Potassium as a Soil Insecticide.**—*Jl. Dept. Agric. Victoria, Melbourne,* xii, no. 7, July 1914 pp. 423–425.

This is a review of Molinas' article on the advantages of sulpho-carbonate of potassium as a soil insecticide, [see this *Review,* Ser. A, ii, pp. 362–363]. It is added that planters of new vineyards in Switzerland are compelled to dip their young vines, before planting them, in a solution of 3 per cent. sulpho-carbonate and 1 per cent. soft soap. The following directions for preparing sulpho-carbonate solution are given: Saturate a solution of caustic potash with sulphuretted hydrogen, and to 10 parts by weight of this product add 8 parts of a 37 per cent. solution of caustic potash. Concentrate this solution to a paste and add, at 40–42°C., with frequent stirring, 4 parts carbon bisulphide—this dissolves after 3 hours; dilute until the solution contains 7 per cent. carbon bisulphide, which is about half the strength of Molinas' commercial sulpho-carbonate.

**The Preparation of Lime-Sulphur Solution: Recommendations by the Sub-Committee on Fruit Culture.**—*Agric. Gaz. N.S.W., Sydney,* xxv, no. 7, July 1914, pp. 620–622.

This is a summary of the proportions [see this *Review,* Ser. A, p. 470] and method of manufacture of lime-sulphur solution. The following proportions by weight: 50 parts pure lime, 100 parts pure

sulphur and 500 parts of water should be used. Commercial sulphur is generally fairly pure, and building lime contains 95 or 96 per cent. of pure lime. For practical purposes the following amounts are recommended: 53 lb. freshly burnt quicklime, 100 lb. flowers of sulphur, 50 gallons, *i.e.*, 500 lb., of water, to make 50 gallons spray fluid. Details for the manufacture of lime-sulphur solution are then given: boiling should be carried out in an iron boiler, but the volume of the boiled mixture should not exceed three-quarters of the containing boiler. Mark the height to which the cold water used will rise when it is boiled, making allowance for the expansion of the water (50 gallons equals 52½ gallons at boiling point). Place the lime and sulphur in the boiler and add half the amount of water to be used, mix and stir thoroughly, add the second half of the water and boil. Boil briskly for an hour from the time the mixture is raised to the boiling point; stir and mix carefully to prevent the sulphur floating on the surface and to keep down the froth, which will reach its maximum fifteen minutes after boiling starts, and will then decrease. Water lost by evaporation must be replaced at intervals by hot water. It is better to use large boilers when possible; if smaller boilers must be used the following mixture is recommended: 53 lb. lime, 100 lb. sulphur and 25 gallons of water boiled together for an hour and diluted with an equal volume of water immediately after boiling; less than 25 gallons of water cannot be used with these quantities.

The spray fluid should be diluted as follows: for winter spraying, add 1 gallon concentrated lime-sulphur spray to 7 gallons water; for summer spraying of deciduous trees, 1 gallon of spray to 28 of water; for citrus trees, 1 gallon of spray to 20 of water. The concentrated lime-sulphur solution should be used shortly after making, the estimated cost of the spray being 4*d*. per gallon. The lime used must be of the best quality and freshly burnt, "quick lime," "stone lime," and "building lime" are the best; if slaked lime is used, 70 instead of 53 lbs. are required, and it must be really freshly slaked.

FROGGATT (W. W.). **Pests and Diseases of the Coconut Palm.**—*N.S.W. Dept. Agric., Sydney*, Science Bull. no. 2, July 1914, pp. 3–63, 9 plates, 9 figs.

*Eurytrachelus pilosipes*, Waterh., does much damage in the Solomon Island plantations, though unrecorded from other parts of the world. It bores into the stem under the shelter of the base of the leaf stalk; 3,000 were collected in one month on Ufa Island. It also occurs on papaw trees. Probably like other Lucanid beetles, it feeds on dead or dying plant tissue and the destruction of fallen timber will cause the disappearance of the pest. The Dynastid beetle, *Xylotrupes nimrod*, Voet., which is perhaps not distinct from *X. gideon*, L., has a wide range over the coast districts of New Guinea, the Malay Archipelago, New Ireland, Solomon Islands and adjacent groups. It bores into the base of the leaf stalk, thence into the base of the crown of the palm, where, if not checked, it will kill the terminal bud and destroy the tree. Another Dynastid, *Trichogomphus semmelinki*, Ritz., is reported to damage young coconut palms in the same way as *X. nimrod*. *Oryctes rhinoceros*, Lind., is common

in Java, the Philippine Islands, India and Ceylon, and attacks the tree at the crown. The eggs are laid in the soil or decaying vegetable matter in June or July; the larvae pupate in September, and the beetle emerges in October, but remains in the soil until May. The beetles, being large and nocturnal, are easily caught and might be attracted by a powerful lamp. Since they never oviposit in healthy palms, all decaying stumps, etc., should be removed. This rhinoceros beetle was first noticed in Samoa, in November 1910, and the larvae or immature beetles seem to have been introduced with vegetable matter round the roots of rubber plants from Ceylon. It spread rapidly and steps were taken to destroy the pest, chiefly by catching the beetles in pits covered over with decaying vegetable matter. Up to 14th February 1912, the Samoan Government destroyed: eggs, 35,591; larvae, 5,475,292; pupae, 44; adult beetles, 102,355. [See this *Review*, Ser. A, ii, pp. 26, 98.]

The weevil, *Rhynchophorus ferrugineus*, Oliv., infests the coconut and toddy palms and is more difficult to deal with than *O. rhinoceros* because it enters the stem or leaf stalk by a smaller hole. Badly infested trees should be cut out and burnt. *Rhabdocnemis obscurus*, Boisd., is supposed to be a native of Tahiti, from whence it was introduced in the stems of bananas into the Hawaiian Islands; it is probably also a native of New Guinea, North Queensland, New Ireland and the Solomon Islands. It may have been introduced into Fiji, where from 6 to 30 per cent. of the crop of sugar was damaged in 1908 by it. Usually only diseased palms are attacked. The beetles should be trapped with split pieces of decayed sugar-cane before they have oviposited, a method which has been successfully adopted on the Fiji sugar plantations. *Calandra taitensis*, Guér., was described from Tahiti seventy years ago, but does not seem to have spread like the larger weevils; it is most plentiful in the Society Islands.

Several HISPIDAE attack coconuts, including *Brontispa froggatti*, Sharp, first recorded from New Britain and now known throughout the Solomon Islands, where it is the most serious coconut pest. The beetle crawls into the folds of the opening fronds, where it oviposits. Against it the following control method is generally adopted: the operator opens out an infested frond with one hand, while with the other he shakes some tobacco and soap wash out of a bottle through a perforated cork, which is more economical than spraying; the liquid kills all the beetles and larvae it touches. The mixture is composed of tobacco leaf-stalks boiled down and 3 tablets of Sunlight soap to each 12 gallons of tobacco wash, the cost of 40 gallons being between 1*s*. 6*d*. and 2*s*. *Promecotheca opacicollis*, Gestro, is the worst coconut insect pest in the New Hebrides. The damage done is twofold: swarms of beetles settling on the under-surface of the fronds gnaw out parallel grooves in them, while the larvae mine the foliage. A large percentage of the eggs are parasitised by a Chalcid. As control measures, sprays and contact poisons are unsatisfactory, but scorching with torches has been tried; in young plantations numbers have been caught by being shaken off the fronds into specially constructed screens.

*Promecotheca antiqua*, Weise, has been recorded from German New Guinea, New Britain and the Solomon Islands. Against *Promecotheca*

*coeruleipennis*, Blanch., it has been found a good plan to cut off the tips of infested fronds. The cosmopolitan *Necrobia rufipes*, De Geer, is very abundant in copra in the Philippine Islands ; it is best controlled by fumigation with carbon bisulphide under a tarpaulin.

The Longicorns, *Xixuthrus costatus*, Mont., from Russell Island Group and Java, and *Olethrius tyrannus*, Thoms., in the Solomon Islands and the New Hebrides, also damage coconuts.

The Phasmids, *Graeffea* (*Lopaphus*) *cocophaga*, Newp., which has a wide range in New South Wales, New Caledonia, Caroline Islands, Cook Islands, Tonga, Samoa, Solomon and Marquise Islands, and *Hemarchus* (*Phibalosoma*) *pythonius*, Westw., greatly damage the coconut foliage. Where they attack trees of moderate height, the foliage can be sprayed with lead arsenate.

Several species of locusts and grasshoppers occur in the Solomon Islands, where they attack the palms. They should be poisoned before they reach the flying stage by spreading poisoned food underneath the trees. The simplest arsenical spray is : white arsenic (arsenious oxide) 1 lb. ; washing soda, 1 lb. ; sugar or treacle, 2 to 4 lb. ; water, 17 gallons. Boil the arsenic and soda together in a kerosene tin with 2 gallons water, and when dissolved, add the sugar already in solution in the rest of the water, making the whole up to 17 gallons.

*Aleurodicus cocois*, Curtis, formerly infested coconut palms in Barbados and the guava in Trinidad, but has not been recorded on the coconut since 1831.

The numerous Coccids include *Aspidiotus destructor*, Sign., which is the worst scale-insect attacking the coconut, and is very widely distributed. Kerosene emulsion or resin-wash is an effective spray against it, while fumigation might be employed where a large number of small trees are infested. *A. oceanica*, Lind., occurs on the coconut fronds in the South Sea Islands. If the palms are sufficiently small, spray with kerosene emulsion, red oil or resin-wash ; where the ground is clear it would be as cheap to tent and fumigate the palms.

*Hemichionaspis* (*Chionaspis*) *aspidistrae*, Sign., is doing great damage to the coconut palms in the New Hebrides, where it often covers the trunks as well. Spraying with red oil or kerosene emulsion is advised, a steam sprayer being required for the larger trees. *Dactylopius* sp., was found clustering round the foot-stalks and fingers of the bunches of young coconuts. It would be advisable, where these are found, to open out the base of the sheath and brush out all the pests with a paint-brush dipped in tobacco and soap emulsion or weak kerosene emulsion.

The flower and fruit of the coconut are attacked by the Pentatomid bug, *Axiagastus cambelli*, Dist., which is well known on the Solomon Island plantations. The caterpillars of the Zygaenid, *Leonana iridescens*, B. B., occur in great numbers on the undersides of the fronds, on which they feed. At present they are confined to Fiji. Small palms may be sprayed with kerosene emulsion or resin-wash. The larva of the Pyralid, *Harpagoneura complena*, Feld., causes slight damage by eating away the young nut and causing it to fall before it is ripe. In the New Hebrides they were observed inside the flower spathes, where they did considerable damage.

Kolodzeisky (F.). **Нѣсколько словъ о личинкѣ майскаго жука.** [A few words on the larva of *Melolontha*.]—**«Вѣстникъ Винодѣлія.»** [*Herald of Viticulture*], *Odessa*, 1914, nos. 7–8, July–August, pp. 402–403.

In 1911, the larvae of *Melolontha* destroyed some 70 per cent. of all the plantations in Central Bessarabia, in one place of 5,000 young plants only 500 remained. The larvae appear periodically every four years, being preceded the previous year by the beetles. In 1914, a great outbreak of the beetles occurred in some districts of Bessarabia at the beginning of May and they destroyed the foliage of plums, cherry, apple and other fruit trees, also of forest trees, especially ash. An outbreak of the larvae may therefore be expected next year, and vine-growers should take precautions against them by deeply ploughing the soil of existing vineyards, as well as of new ones, which will result in the destruction of the larvae from frost during the winter; by placing trap heaps of dung about the vineyards, and by poisoning the larvae by powdering the roots of the vines early in spring with Paris green; powdering can be done by means of hand bellows or an ordinary rubber syringe. Paris green should be used in the same way against the larvae of *Polyphylla fullo*, L., which does enormous damage to vineyards in the Government of Taurida.

Lakin (G. I.). **Астраханское виноградство въ 1913 году.** [Astrachan viticulture in 1913.]—**«Вѣстникъ Винодѣлія.»** [*Herald of Viticulture*], *Odessa*, July–August 1914, nos. 7–8, pp. 390–399.

In addition to an account of the general state of viticulture in the government of Astrachan during 1913, some experiments against various vine pests conducted by the local Entomological station are reported. A series of experiments on different insecticides and fungicides was undertaken in a vineyard, which in the previous year was greatly infested with mildew, *Oidium* and *Polychrosis botrana*, Schiff. On 3rd April, the whole of this vineyard was disinfected with iron sulphate, 1 lb. in 9 gallons of water, after which part of it was left at the disposal of the owner, while the remainder was divided into eight plots and each of them was sprayed twice—on 23rd May and 3rd July—with various solutions, with the following results:—(1) lazurin (1 lb. in $4\frac{1}{2}$ gallons of water) destroyed mildew, but had no effect on the moth; (2) polysulphides (1 lb. in 17 gallons of water) destroyed *Oidium*, but neither mildew nor the insect; (3) lazurin and Paris green (10 lb. of lazurin, $\frac{1}{2}$ lb. of green in 43 gallons of water) destroyed both mildew and the insect; (4) lazurin and djipsin (5 lb. of lazurin, 1 lb. of djipsin in 86 gallons of water) had the same effect as No. 3; (5) polysulphide and djipsin (5 lb. of polysulphide, 1 lb. of djipsin in 86 gallons of water) destroyed both *Oidium* and the insect; (6) polysulphide and green (1 lb. of polysulphide, 1 lb. of green in 86 gallons of water) destroyed both *Oidium* and the insect, but scorched the leaves and cannot therefore be recommended; (7) Paris green, (1st spraying, 3 oz. of green, 6 oz. of lime in 18 gallons of water; 2nd spraying, 3 oz. of green, 6 oz. of lime in 14 gallons of water) destroyed the insect but not the fungi; (8) djipsin (1st spraying 1 lb. in 86 gallons of water; 2nd spraying double strength) had the same

effect as No. 7. All these plots, with the exception of Nos. 2, 5 and 6, were also powdered with sulphur on 10th June during the blossoming of the vines. The first part of this vineyard was not treated in any way by the owner, except that on the 18th July it was again sprayed with iron sulphate; *Polychrosis botrana* was found there in greater numbers than in the part under experimental treatment, but the vines were free from mildew, which is attributed to the effect of the first spraying with iron sulphate early in spring. A case of bag treatment applied by one owner with good results is recorded. The bags are about 10 inches long and are made from "Persian" cotton, each bag costing about $\frac{1}{4}$*d.* and lasting for three years if kept in a dry place after the harvest. The bags are put on the clusters after the blossoming and before oviposition; should it happen that a moth hatches out on a cluster thus covered, it is unable to produce a second generation. The bags do not affect the colour of the grapes.

**Root Borers.**—*Agric. News, Barbados,* xiii, no. 320, 1st August 1914, p. 250.

*Exophthalmus famelicus* was stated by G. Bordaz [see this *Review*, Ser. A, ii, p. 602] to be attacking cacao and lime trees in Martinique and Guadeloupe. The specimens have since been identified as *Diaprepes abbreviatus*, L., the Barbados root borer, a distinct species. *E. esuriens*, reported from St. Kitts, is now recorded for the first time from Barbados. The many forms of *D. abbreviatus* and *D. spengleri* are now known to occur in Barbados, Grenada, St. Vincent, St. Lucia, Martinique, Guadeloupe, Dominica, Montserrat, Virgin Islands, St. Croix and Porto Rico. *E. esuriens* has been recorded from Barbados, Dominica, Montserrat, Antigua, St. Kitts and Nevis.

Blandini (E.). **Contro il bruco dei fagioli.** [Against the bean *Bruchus*.] —*Il Picentino, Salerno,* iii, no. 8, 1st August 1914, p. 338.

The following is a simple method of protecting stored beans against the attacks of the bean *Bruchus*:—Immediately they have been threshed the beans are put into cases or barrels. For every hundredweight of beans $\frac{3}{4}$ oz. of carbon bisulphide is taken and placed in a tumbler covered with a piece of cloth, which is then sunk a few inches into the mass of beans and the case is covered with a blanket. On the third day the beans are taken out and spread about in order to free them from the smell of the bisulphide.

Moore (W.). **Precautions against White Grubs for Next Year.**—*Minnesota Insect Life, St. Anthony Park,* ii, nos. 11–12, 1st August 1914, pp. 6–7.

Four species of "white grub" beetles were abundant in Minnesota in the summer of 1914. *Lachnosterna fusca*, Frohl., was very abundant in the South; *Lachnosterna rugosa*, extending slightly farther north to Ottertail; *Lachnosterna dubia*, as far south as Brown County; *Lachnosterna grandis*, occurring in isolated areas from Roseau to Winona Counties. In order to prevent a recurrence of this pest the following advice is given: Any fields which have been in sod or timothy should be ploughed early and pigs let into the fields to root out the grubs; they should not be planted with maize, potatoes, strawberries or other plants readily attacked by *Lachnosterna* grubs.

HINDS (W. E.). **Cotton Worm Control.**—*Alabama Agric. Expt. Sta., Auburn,* Press Bull., no. 72, 12th August 1914, 4 pp.

Arsenate of lead may be applied in heavy doses without burning the foliage or checking the setting of the bolls and is not dangerous to the operators. As many pounds of powdered arsenate per acre as the cotton is feet in height are necessary, although two pounds will be needed for small cotton, while cotton six feet high can be protected with four or five pounds.

Paris green often scorches the leaves, checks the setting of fruit, and is also liable to cause sores on men and mules engaged in applying it. Not more than 1 to $1\frac{1}{2}$ pounds of Paris green must be used per acre and to every pound 2 pounds of flour must be added. The cotton worm, *Alabama argillacea*, feeds on nothing but cotton; the first signs of injury usually occur in low wet places where the cotton is rank. At the time of the first appearance of the pest it does not usually pay to treat the whole field, unless the caterpillars are scattered throughout it. If this occurs during late July or early August and the season is wet and the cotton rank, there is great probability of extensive damage, which may be expected in from 10 to 15 days after the larvae of the first generation pupate. Every preparation should be made in advance when such conditions prevail, so that the whole of the crop may be treated without delay. The simplest method for destroying cotton worms is to apply powdered arsenate of lead, dusted through bags carried at the ends of a pole or piece of narrow board by a man riding a mule; 15 to 20 acres can thus be treated by one man in a day, and in cases of emergency the work might be continued on moonlight nights. The board may be long enough to cover four rows, and if more than 10 feet long two bags should be used on each side to ensure better distribution of the dust. The spring in the longer boards makes it unnecessary to shake them and they may be simply held firmly on the front of the saddle and the mule ridden at a trot, leaving a cloud of dust behind. When several men are working together they should ride abreast. About three pounds of arsenate may be distributed per acre if unbleached domestic cloth or sheeting be used for the bags; double cheesecloth should be used where it is desired to distribute five or six pounds per acre. The evening is the best time for application, as the caterpillars feed at night and the dew helps to keep the poison in place. It is estimated that the total cost of one application of arsenate of lead is equal to one-third of the minimum saving in the crop. When the cotton boll weevil also occurs before the plants are full-grown, poison should be used for the cotton worm, as only thereby can the largest possible crop be secured. In Alabama, cotton worms should be poisoned until the 10th to 15th of September, but where boll weevils are abundant and the cotton has set all the crop it will, the use of poison for cotton worms should be discontinued. Cotton should be picked as soon as possible after the bolls open, and the planter may then complete the control of the boll weevil which may have been begun by the cotton worm by burying the stalks with a plough or destroying them by fire.

CIMATTI (V.). **Gli insetticidi contro le coccinelle degli alberi da fruta.** [The insecticides used against fruit-tree Coccids.]—*Riv. Agric., Parma,* xx, no. 33, 14th August 1914, pp. 522–523.

In this popular article the usual formulae against Coccids are given. Mention is made of the fact that "pitteleina" is a mixture of tar and caustic potash and that "rubina" is made up of equal parts of tar and caustic soda.

CIMATTI (V.). **Il nemico dei trifogliai.** [The enemy of clover fields.] *Riv. Agric., Parma,* xx, no. 34, 21st August 1914, p. 536.

The following methods of control against the Eumolpid beetle, *Colaspidema atrum,* are recommended:—Sprinkling the leaves with lime or preparations containing naphthalin; surrounding the infested spot by a deep trench and sprinkling the leaves with a mixture of 1 part naphthalin and 3 parts lime; spraying with the following solution:—Anhydrous sodium arsenate, 7 oz., lime (in paste form), $5\frac{1}{2}$ oz., water, 11 gallons. To prepare the solution both the arsenate and the lime are dissolved separately in about 2 gallons of water each and the lime solution is then added to that of arsenic with vigorous stirring, the remainder of the water being added at the same time. Cattle will not be poisoned if the clover is used after a month has elapsed or if rain has washed the poison away. Another useful insecticide is Swift's lead arsenate.

ENIKIEV (Prince N.). **Борьба съ озимымъ червемъ.** [The fight against caterpillars of *Euxoa segetum.*]—**«Земледѣльческая Газета.»** [*Agricultural Gazette*], *Petrograd,* 15th August 1914, no. 31 (43), pp. 1026–1027.

Great damage was caused by caterpillars of *Euxoa* (*Agrotis*) *segetum* to winter-sown crops in the district of Borovitch of the government of Novgorod in 1913, and the following remedies against this pest are recommended: Rye must be usually sown as early as possible, not later than 7th August, but if badly attacked, it may be necessary to replough the field deeply and sow again. Before sowing, the rye-seed must be sprinkled with kerosene, about 1 pint to every 6 bushels. In warm autumns it is better to sow rye late, after the caterpillars have disappeared, than to have the crops destroyed by the pests. The author had once to replough a field damaged by the caterpillars and to re-sow it on the 21st September, when, owing to the warm weather, the crop grew strongly enough to survive the winter and gave a good harvest, the only difference being that the straw was shorter than that of rye sown earlier. Fields intended for winter sowing must be manured in May, and deeply ploughed.

MOLINAS (E.). **A propos de pucerons.** [Concerning aphids.]—*Progrès Agric. Vitic., Montpellier,* xxxi, no. 33, 16th August 1914, pp. 207–211, 2 figs.

The portable forge required in Chambaud's system of nicotin fumigation [see this *Review*, Ser. A, ii, pp. 390–391] is not always available, and the same results may be obtained by a simpler method. A ball

of wood-shavings, about 8 inches in diameter, is placed in a pail and from 3½ to 5 oz. of tobacco juice poured over it. When all the liquid has been absorbed, the ball is put in a basket of wire gauze, in which some tow has first been placed. A piece of this tow is pulled out, and when soaked in methylated spirit, is used as a wick. The basket is suspended in the tree and, in order to prevent any risk of fire, a piece of wire gauze is placed over its mouth and a sheet of tin, 20 inches square, beneath it. Fumigation is then carried out under a bag-like tent as in Chambaud's system, which required three men, one being constantly engaged in attending to the forge. With this modification, only two men are necessary. With one cover in use they can fumigate from five to six trees per hour, or ten trees, if two covers be available. The material for the cover in nicotin fumigation need not be impermeable, as required with hydrocyanic acid. A cover of suitable material, 7 yards square, costs about £2 3*s*. The cost per tree is about that stated by Chambaud, viz.: 2*d*. per tree if one cover is used, or 1½*d*. with two covers. In any case, it is important to fumigate as early as possible.

Some apple trees at the Agricultural School of Montpellier had purposely been left unfumigated. In mid-June they were free from aphids, owing to natural control, in which a small Hymenopterous parasite took a leading part. Where parasites are known to be present, a tree might be set apart and used for breeding beneficial insects brought from other trees. *Trioxys auctus* and *Aphidius crepidis* have been used in this way [see this *Review*, Ser. A, ii, pp. 620–621].

DAVIS (J. J.). **The Oat Aphis.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 112, 21st August 1914, 16 pp., 9 figs.

*Aphis avenae*, F., is second in importance in the United States only to *Toxoptera graminum*, Rond.; it does not occur in such abundance as that species, but is constantly present on wheat, occurring at the base of the plant and on the roots, and is responsible for the loss of thousands of bushels annually. The distribution of *A. avenae* is almost world-wide, and it occurs in all parts of Europe, and in most of the United States except the Gulf region. A description of the various forms, the winged and wingless viviparous female, the winged male and the wingless oviparous female, is given. The eggs are laid in the axils of the leaf-buds or in the crevices of the straw. *A. avenae* may be distinguished from *Macrosiphum granarium*, Kirby, *T. graminum*, *A. pomi*, de G., and from *A. sorbi*, Kalt., by the pinkish, orange or reddish areas on the abdomen, at the bases of the cornicles. A list, stated to be incomplete, of the host plants of this *Aphis* is given. These are largely GRAMINEAE, including *Triticum, Secale, Avena, Hordeum, Phleum, Poa, Bromus, Festuca, Melica, Andropogon, Elymus, Zea*; *Typha latifolia* is recorded as a host for *A. avenae* for the first time in the United States. Experiments showed that this aphid would not breed on *Muhlenbergia, Agropyrum occidentale, Panicum virgatum*, or *P. bulbosum*. *A. avenae* is usually found on *Triticum, Carex, Malus* and *Pyrus* in autumn and spring, on *Malus* and *Pyrus* before June, and on *Avena, Triticum* and *Carex* later in the summer. Many of the early records of infestation of *A. avenae* are valueless owing to confusion in identification. Climate is an important factor

in its control, for it breeds at about 40° F., while *Aphidius testaceipes*, Cress., its chief parasite, is hardly active below 56° F.; consequently mild winters and cool springs allow the aphis to multiply unchecked by *A. testaceipes*. Spring colonies originate either from viviparous females, which have wintered on wheat, grasses, etc., or from migrants, which are the progeny of sexual forms, from apple and related trees. With the approach of winter, the aphids seek the lower parts or roots of the wheat or grasses, where the viviparous females pass the winter, while the winged forms migrate to apples or allied trees. Experiments show, however, that the apple is not necessary as an alternative host, especially in the Southern states. *A. avenae* has been reared through more than 60 consecutive viviparous generations, with the aid of a greenhouse in winter. The period from birth to maturity varies from 6–15 days, and four moults occur. Other experiments show that this species can survive somewhat severe winters as viviparous females. Natural agencies which check *A. avenae* include the following parasites: *Pachyneuron micans*, How., *Aphidius testaceipes*, Cress., (*tritici*, Ashm.); *A. nigriceps*, Ashm., and the following predaceous insects: *Syrphus americanus*, Wied., *Aphidoletes* sp., *Hippodamia parenthesis*, Say, *Coccinella 9-notata*, Herbst, *C. 5-notata*, Kirby, *Cycloneda munda*, Say, *Megilla maculata*, De G., *Scymnus* sp., and most important of all, the Coccinellid, *Hippodamia convergens*, Guér.; many CHRYSOPIDAE are also known to feed on *A. avenae*. *Gonatocerus brunneus*, Ashm. [M.S.] and *Polynema longipes*, Ashm. (*Cosmocena citripes*, Ashm.) are also believed to prey on it.

Preventive measures recommended include destroying all rank-growing wheat near straw-stacks, in early or late autumn; allowing cattle to pasture in wheat and oat-fields in late autumn and early winter; planting wheat as far as possible from the previous year's fields, from standing straw-stacks or from apple or other host-plants. Where only small areas are badly infested, spray with "black leaf 40," 1 part to 900 parts of water, and 1 lb. soap to 100 gallons of spray liquid; where the aphids migrate freely to apple, spray the trees, just before the eggs hatch, with commercial lime-sulphur mixture, 1 part to 8 parts water.

SURFACE (R. A.). **Borers in Hickory Trees.**—*Zool. Press Bull., Penns. Dept. Agric., Harrisburg*, no. 278, 24th August 1914.

The following note on the sawfly, *Tremex columba*, is given in answer to an inquiry from W. Pennsylvania, where 50–60 per cent. of *Carya alba* trees have been killed in the last four years by this borer: The females lay their eggs beneath the bark of various trees; their natural enemies, which include woodpeckers and *Thalessa*, are their most effective checks; it is advised, wherever possible, to inject carbon bisulphide into the holes and to close these with clay.

**Paranaph and Scalo.**—*Agric. News, Barbados*, xiii, no. 322, 29th August 1914, pp. 282–283.

Paranaph is a saturated solution of naphthalin in paraffin oil, combined with soft soap. Combination is easy when the soft soap is boiling and

a semi-solid product results, 1 to 1½ parts of which readily dissolve in 100 parts of water. This solution has proved a most effectual remedy against sucking insects. To prepare Paranaph take 56 lb. of the best soft soap (the Chiswick Imperial is recommended) and add 2 gallons of water. Simmer over a fire with constant stirring until all lumps have disappeared. Add 6 lb. of naphthalin and stir until dissolved. Remove from the fire and add 2 Imperial gallons of ordinary kerosene oil. Stir until uniform. The finished product is semi-solid and dissolves readily in cold water so as to give a milky emulsion. Lefroy found that a very satisfactory emulsion could be obtained as follows :—10 lb. of whale-oil soap is heated to the boiling point, or, if it contained much water, boiled for a time to drive off the excess. In the boiling soap 4 oz. of naphthalin are dissolved ; 5½ pints of crude Barbados petroleum are added and the mixture accomplished by vigorous stirring. This mixture easily dissolves in water and is most efficient in killing scale-insects. Scalo [see this *Review*, Ser. A, ii, p. 144] is a modification of paranaph and Lefroy's mixture due to Mr. J. C. Moore, Agricultural Superintendent, St. Lucia. Scalo is made up as follows : Whale-oil soap 56 lb., water (2 gals.) 20 lb., naphthalin (crude) 6 lb., kerosene (1 case of 8 Imperial gals.) 65 lb. The whale-oil soap and water are heated until the soap is dissolved. The naphthalin is then added, and while this mixture is boiling vigorously it is removed from the fire and half the kerosene oil is added and stirred in with a flat paddle. This will cool the mixture and it will be necessary to heat it again to boiling point in order to work in the remainder of the oil. Care must be exercised in this part of the process that there is not a sufficient amount of free oil present to take fire. Scalo is very efficient in treating the more common scale-insects.

Paranaph has been recommended in Jamaica for ridding houses of fleas, for destroying ticks on animals [see this *Review*, Ser. B, ii, p. 203], for killing scale-insects (it is not thoroughly effective against such a resistant insect as *Chionaspis citri*), green fly or aphides of various kinds.

Scalo combines a very high percentage of kerosene and whale-oil, possesses good wetting qualities and is effective against such resistant insects as the orange mussel or purple scale (*Lepidosaphes beckii*), and does no injury to the young leaves and shoots of orange trees even when used at the rate of 1 lb. to 1 gallon of water.

*Exophthalmus esuriens* **on sugar-cane in St. Kitts.**—*Agric. News, Barbados*, xiii, no. 322, 29th August 1914, p. 287.

As the result of an experiment with root-borer grubs, the adult has been found to be *Exophthalmus esuriens* [see this *Review*, Ser. A, ii, p. 603], which was not definitely known previously to be a pest of sugar-cane in St. Kitts. The eggs have been discovered on the split leaves of the sugar-cane.

Fantozzi (M.). **Il fleotribo negli uliveti della Bassa Sabina.** [*Phleotribus* in the olive groves of the lower Sabine region.]—*L'Agricoltura Sabina, Poggio Mirteto*, xiii, no. 8, 31st August 1914, p. 35.

The Scolytid beetle, *Phloeotribus oleae*, F., has injured many olive trees in the lower Sabine region (Umbria), the trunks being bored

by both adult and larva. When the temperature rises at the end of winter, the females oviposit in sinuous galleries in old or sickly trees and in withered branches. The larva bores a new gallery between the wood and the bark, with ramifications at right angles to it. The adult emerges by piercing the bark and attacks the branches in blossom. In about a fortnight, between May and the end of June, the eggs of the second generation are laid, sometimes on healthy branches. The second generation is more numerous and injures the year's crop of olives by attacking the fruit-branches. To control *Phloeotribus*, pruning about once a year is advisable, the débris being stacked in heaps until the end of April, when it should be burned, together with the eggs which this Scolytid will have deposited on it. Branches, etc., which have been stored for firewood should also be destroyed not later than mid-July. Where infestation is severe, the branches may be sprayed with a 1 per cent. solution of lead arsenate in February and May—i.e., before oviposition takes place. Timely control of *Phloeotribus* also checks a smaller allied borer, which has done enormous damage in Liguria in the last few years.

Nedrigailov (N. O.). **О борьбѣ съ мучнистой болѣзнью крыжовника и личинкой хруща.** [On fighting *Spherotheca* and larvae of *Melolontha*.]— **« Плодоводство.»** [*Horticulture*], *Petrograd*, no. 8, August 1914, pp. 552–554.

Endeavours to fight the larvae of *Melolontha* by means of carbon bisulphide more or less failed, as it was necessary to inject it into the soil almost every week, and it was found to scorch the roots of the plants. In that district of the government of Poltava in which the orchards investigated are situated, these pests have destroyed in one year some 40 acres of plantations. It was found by experiment that the larvae cannot move about readily in hard clay or in wet soil, and the soil most suitable to the larvae is loose dry earth. It was also observed that in places shaded by large trees, where the earth retains its moisture, only few larvae were present. The planting of young apple trees in the shade of five-year-old acacia trees has had satisfactory results, and in a few years it will be possible to remove the acacias, as the apple-trees will then be big enough to provide the necessary shade themselves. Planting at the bottom of pits 3 feet or more deep, the walls of which afforded shade and which could be flooded with water was also effective in keeping away the larvae.

Vostrikov (P.). **Опытъ примѣненія мышьяковисто-кислаго натра въ борьбѣ съ саранчей.** [An experiment on the application of sodium arsenite in the fight against *Locusta migratoria*.]— **« Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan*, no. 8, August 1914, pp. 518–519.

The results of the campaign against *Locusta* (*Pachytylus*) *migratoria* in the delta of the Volga, organised by the Astrachan Board of Agriculture, are given. At first the only measure adopted was spraying with Paris green, but in the middle of June, when the locusts were in their third stage,, a sodium arsenite mixture, consisting of

4 parts of sodium arsenite, 3 parts of water and 4 parts of molasses, was tried. The price of this composition locally is about $3\frac{3}{4}d.$ per lb. In wet weather, 1 lb. of this insecticide in $13\frac{1}{2}$ gals. of water was found to scorch the plants, while 1 lb. in 19 gals. of water only scorched plants in dry weather, under which circumstances a still weaker solution, 1 lb. in $32\frac{1}{2}$ gallons of water, was found necessary. Even this strength would have probably caused scorching in a dry steppe locality, but not in the delta of the Volga, owing to the damp weather and heavy dews. The result was satisfactory in all cases, producing a death-rate of 100 per cent. Paris green gave also excellent results, but is more difficult to handle and prepare, and is at least 15 times as expensive as sodium arsenite, under the local conditions.

**Смѣтныя предположенія Земства Астраханской губерніи на агрономическую помощь населенію за 1915 годъ.** [The projected estimates of the Zemstvo of the govt. of Astrachan for the agronomical assistance to the population in 1915.]—**«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan*, no. 8, August 1914, pp. 520–532.

It appears from the above estimates, the total of which amounts to £53,000, that £3,000 are assigned for the control of pests of agriculture, of which a little more than one-half is borne by the Zemstvos of the Government and of the various districts and the remainder by the Central Board of Agriculture.

Plotnikov (V.). **Вредители садоводства въ Семирѣчьѣ.** [The pests of Orchards in the province of Semiryetchensk.]—**«Туркестанское Сельское Хозяйство.** [*Agriculture of Turkestan*], *Tashkent*, no. 8, August 1914, pp. 740–642.

This article contains a list of pests found in the province of Semiryetchensk during the first half of June 1914. Young larvae of *Cydia pomonella* and *C. funebrana* were attacking fruits, and traces of injury by *Rhynchites auratus*, Scop., on cherry trees were visible. Large numbers of *Lepidosaphes ulmi*, L., were found on apple trees, while on various fruit trees was a species of *Lecanium* not previously observed in Turkestan. *Scolytus rugulosus*, Ratz., *Lymantria* (*Ocneria*) *dispar*, L., and *Hyponomeuta variabilis*, Zell., were found, the last-named being very abundant in one locality. Some years ago the caterpillars of this pest did great damage in the orchards over the whole province, and a new outbreak in the near future is very probable. Against it spraying with Paris green (1 oz. of green and 2 oz. of freshly slaked lime in 9 gals. of water) or with djipsin (2 oz. djipsin paste in 9 gals. of water) in the second half of May is recommended.

*Eriocampoides limacina* (*Eriocampa adumbrata*, Klg.) is an important pest in this province, where it particularly damages pear trees. Control measures include spraying with Paris green, djipsin, or tobacco extract, or powdering with half-slaked sifted lime (12 lb. of lime in about half a gallon of water). Deep digging in spring beneath the attacked trees prevents the pupation of the larvae. A few specimens of *Psylla pyricola*, Forst., and of *Coleophora* sp. were found, while *Aphis mali*, F., and other Aphids were also present. Orchards swarmed

with *Tetranychus telarius*, L., and *Eriophyes* sp. These should be controlled by powdering with a mixture of equal parts of sulphur and lime or spraying before the swelling of the buds with a solution made from 3 lb. of sulphur, 3 lb. of lime and 27 gals. of water, or with California mixture, the latter being particularly effective against *Eriophyes*.

Nagaibakov (V.). **Борьба съ кровяной тлей въ сезонъ 1914 года.** [The fight against *Schizoneura lanigera*, Hausm., during the 1914 season.]—**« Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*], *Tashkent*, no. 8, August 1914, pp. 742–745.

The author has conducted a campaign against *Schizoneura lanigera* in the orchards in the district of Tashkent, organised by the Entomological Station of Turkestan. This pest has but comparatively recently appeared in Turkestan, but has nevertheless spread over considerable areas, and in the above orchards at least 20 per cent. of the trees are infested. Spraying was undertaken with quassia emulsion, kerosene lime emulsion, and tobacco extract, and the trees were smeared with fat. The mode of preparation of the insecticides was as follows:—(1) For quassia emulsion: 30 lb. of quassia chips were boiled in about 27 gals. of water for 2 to 3 hours, the decoction being afterwards strained and mixed with 20 lb. of green soap, dissolved in warm, soft water; the whole was then made up with water to a total volume of 210–240 gals. (2) For kerosene-lime emulsion: Milk of lime prepared from about 2 oz. of lump lime is mixed with 3 lb. of kerosene, after which the mixture is emulsified with a small bundle of twigs; water is added to make up $2\frac{3}{4}$ gals. of the mixture, after which it is again well stirred. (3) For tobacco extract, 1 lb. of Pastack's extract and $\frac{1}{3}$ lb. of green soap are dissolved in $2\frac{3}{4}$ gals. of water. The spraying with all these insecticides must be repeated after 12 hours, in order to ensure the total destruction of small colonies of lice, which may be sheltered in the foliage. Owing to the great heat prevailing, the spraying was done from 5 to 9 a.m. and from 4 to 4.30 p.m. Tobacco extract in the above proportion caused scorching of the foliage, while a weaker solution was less effective, and this insecticide was therefore not further used; the other insecticides caused no scorching. Smearing all the branches and the trunks of the trees with grease was very effective; it must be done in spring before the unfolding of the buds, or in autumn after the leaves have fallen.

Busck (A.). **A Destructive Pine-Moth Introduced from Europe.**—*Jl. Econ. Entom., Concord*, vii, no. 4, August 1914, pp. 340–341, 1 table.

In May 1914, it was reported that a lepidopterous insect was seriously injuring some young Scotch pines in Long Island. The insect proved to be *Rhyacionia* (*Evetria*) *buoliana*, which has hitherto not been reported from America, but which does considerable damage to the pines of Europe and also occurs in Siberia. It is generally recognised as the most injurious insect to *Pinus sylvestris* and other pines, and its occurrence in Long Island is therefore of considerable importance. The eggs are laid on the buds of pine in the late

summer; the young larva eats out a bud and hibernates in it; in the spring it attacks the young swelling buds; as the twigs grow, the larva often eats only one side of them, and thus causes a peculiar curved growth, the so-called "Posttörner," which seriously depreciates the value of the trees; the larvae pupate early in June. There is only one generation in Europe, but as allied species in the U.S.A. have two generations annually, it is possible that *R. buoliana* will develop two broods in this climate and thus become doubly injurious.

HYSLOP (J. A.). **Soil Fumigation.**—*Jl. Econ. Ent., Concord*, vii, no. 4, August 1914, pp. 305–312, 1 table.

An account of experiments to determine whether subterranean insects can be effectively destroyed by fumigating the soil with sodium cyanide is given. There are at present serious disadvantages in the use of this poisonous compound because it kills the beneficial nitrifying bacteria of the soil as well as the pest. It is believed, however, that the soil contains protozoa which feed on these bacteria and these would also be killed by the sodium cyanide, with the result that the newly introduced bacteria would flourish more than ever, the soil being improved. In Hawaii, where protozoa are very abundant in the soil, fumigation with carbon bisulphide has acted as a decided stimulus to crops. The sodium cyanide as used in following experiments was too expensive for farm use, but it is thought that it can be produced in a much cheaper form and can be used in smaller quantities. The cyanide used was a mixture containing: Sodium cyanide, 74 to 76 per cent.; alkaline chlorides, 16–24 per cent.; inert substances, 2–8 per cent. Experiments showed that sodium cyanide cannot be placed in the soil with the fertiliser at the time of sowing, nor during subsequent cultivation, but must be applied at least forty days previously, because this substance was found to be decreasingly poisonous up to from twenty-six to forty days after application. Field experiments corroborated these results in the laboratory. Wire-worms attacking potatoes were found to be effectively destroyed by the use of sodium cyanide. On the 1st October, the cyanide was placed by hand in 15 potato hills, at the rate of 300 pounds per acre. On 4th October when three of the treated hills were examined, the larvae were found inactive and died three days later. On 9th October, when the remaining treated hills were dug out, no living insects were to be found above the depth to which the cyanide had been introduced, i.e., six inches.

GOODWIN (W. H.). **Some Factors affecting Results in the Use of High Temperature for the Control of Insects injuring Cereal Products.**—*Jl. Econ. Entom., Concord*, vii, no. 4, August 1914,, pp. 313–322.

In treating flour mills for the destruction of insect pests affecting cereals, the practical value of high temperature at 48° C. to 50° C. is much lessened when the heated atmosphere contains moisture in proportions greater than 40–50 per cent. Experiments show that 50–55° C., kills all stages of cereal insect pests if they are subjected to this temperature for 1 or 2 hours. Where moisture is present, an increase in the amount of radiating surface is essential and failure to

obtain the killing temperature is often due to lack of sufficient radiating surface to overcome the moisture. For the sake of economy, a dry, warm day should be chosen on which to heat the average flour mill. Maximum economy of heating will be obtained by using a steam pressure of about 50–60 lb., since this gives the temperature necessary to kill. Experiments showed that most species of insects were killed at a slightly lower temperature when using moist heat than when using dry. The rice weevil, *C. oryzae*, was especially susceptible to heat in a moist atmosphere, being always killed at 3° C. to 4° C., below the temperature required in dry air. As a rule the egg stage was the first to be destroyed. *Silvanus surinamensis* was not much more susceptible to moist than dry heat. The egg stage was killed at 44°–45° C., the larvae, pupae and adults at 46°–48° C. *Cathartus advena* is killed at 1° C. lower temperature in moist than in dry heat, and like *S. surinamensis*, does not always recover from the effects of dry heat, but dies several hours or days after the test. The effects of heat on *C. quadricollis*, Guér., (*gemellatus*) seemed to be similar to those on *C. advena*. The adult beetles of *Laemophloeus minutus* require a temperature of nearly 50° C; the larvae and pupae were killed by 48° C.–49° C., and no eggs hatched after being heated up to 45° C. The young larva of *Trogoderma ornatum* is the most resistant of the cereal pests so far tested, the killing temperature being from 52–53° C.; the beetles, pupae and full grown larvae were killed by 48–50° C. Moist atmosphere at 48° C. to 50° C. was fatal to the beetles, pupae and full-grown larvae, but was no more effective than a dry atmosphere at similar temperatures.

Ainslie (G. G.). **The Western Corn Root Worm.**—*Jl. Econ. Entom., Concord,* vii, no. 4, August 1914, pp. 322–324.

The presence of *Diabrotica longicornis*, especially in the Gulf and S. Atlantic States, should be watched for and reported. Along the Arkansas, Mississippi, Ohio and other rivers are large areas of rich land subject to an almost certain annual inundation. The use of the one remedy known for this pest, that of crop rotation, is here impossible, and unless some crop can, occasionally at least, take the place of maize, or other method of control be found, great damage will continue to be done. The eggs are laid in late July, August and September in the ground round the roots. They hatch in late May or early June of the following year, and the larvae are most injurious in late June and early July, especially if there is a drought. The beetles begin to appear in July, and, if sufficiently numerous, cause serious additional injury.

McGregor (E. A.). **Red Spider Control.**—*Jl. Econ. Entom., Concord,* vii, no. 4, August 1914, pp. 324–336.

*Tetranychus bimaculatus* and its control are here discussed [see this *Review*, Ser. A, i, pp. 240, 241, 353]. The so-called "red spider" is commonly found on the English violet or the cultivated one, which generally serves as its winter host, as well as on many cultivated flowers, cotton, tomato and Jerusalem oakweed; infestations in towns nearly always arise from cultivated violets, those in the country from the pokeweed. A particular case of origin from pokeweed is described, where an infestation was seen to extend from a centre

where a large pokeweed stalk, alive with mites, was growing. It is not, however, definitely established whether this plant is a true winter host for the mite. *T. bimaculatus* may be spread accidentally by other creatures, but also travels from plant to plant across interlacing branches. McDonough and the author have recently determined that where isolated patches of infestation occur *T. bimaculatus* has been dispersed by rain; these mites are not, as hitherto supposed, always destroyed when washed off by rain, but require to be submerged for 9 hours before they are killed; they are often carried away and scattered in thousands in the streamlets between rows of crops. Heavy rains decrease the amount of infestation, but also extend the distribution. *T. bimaculatus* does not hibernate and is remarkably adapted to withstand low temperatures. Adults collected after a night temperature of 13° F. rapidly revived on being brought indoors; the young stages are, however, killed by low temperatures. As regards remedial measures against red spider, clean culture and the selection of immune varieties are important. Hite, Russell, Summerour "Half and Half" and Cleveland were the varieties of cotton which suffered least of those investigated. Early planting seems to give better results than late planting. Where infestation has not advanced far, the pulling up and destroying of the first few infested plants is usually effective. Probably ploughing a wide swathe just outside the boundary of infestation would also be useful. A number of spray-combinations were investigated, of which potassium sulphide, 3 lb. to 100 gals., seems to be the ideal red spider spray; 100 gals., applied as a misty spray, was sufficient for an acre of average-sized cotton, and cost 3*s*. An important insect enemy of red spider is the larva of the recently described Cecidomyid fly, *Arthrocnodax carolina*, Felt, which seems to confine its attacks to the eggs. Late in the season, it is itself parasitised by the Chalcid, *Aphanogmus floridanus*. The Anthocorid bug, *Triphleps insidiosus*, preys upon red spider, both as a nymph and an adult, the former feeding chiefly upon the eggs, while the latter destroys the later stages. The Coccinellid, *Stethorus punctum*, as well as *Chrysopa oculata* and *Scolothrips sexmaculata*, also do good work in this respect.

WHITMARSH (R. D.). **The Green Soldier Bug** (*Nezara hilaris*).—*Jl. Econ. Entom., Concord*, vii, no. 4, August 1914, pp. 336–339.

In 1911, peaches along the Marblehead peninsular region of L. Erie were seriously attacked by *N. hilaris*. The bugs attack the fruit from the end of June until late autumn, puncturing the skin and sucking the juices. In 1912, practically no damage was done in this region. In 1913, *N. hilaris* occurred in small numbers on peaches, but was particularly abundant on wild cherry in the latter part of June and later on elderberry, black haw and dogwood (*Cornus alternifolia*). Adults first appeared in the middle of June and were abundant until the end of the month, disappearing after the middle of July. The period from the egg to the adult varies, the shortest period recorded from the time of hatching of the egg to the adult stage was from July 23rd to September 10th, forty-nine days, the eggs having been laid on July 14th; the longest period, until October 6th, or seventy-five days. The nymphs moulted five times and hibernated as adults.

Ramsay (J. T.). **Potato Culture.**—*Jl. Dept. Agric., Victoria, Melbourne,* xii, pt. 8, August 1914, pp. 483–499, 1 table, 5 figs.

In this article on potato culture it is recommended that seed potatoes should be dipped for two hours in a solution of corrosive sublimate, 1 oz. to 6 gallons of water, before planting. The following spray solution is recommended as a good insecticide: 2 lb. copper sulphate, 2½ lb. washing soda to 10 gallons water, 1 oz. Paris green.

Froggatt (W. W.). **A Descriptive Catalogue of the Scale-Insects (Coccidae) of Australia.**—*Agric. Gaz. of N.S.W., Sydney,* xxxv. pt. 8, August 1914, pp. 677–684, 1 pl.

Two new species are included in this catalogue, viz.:—*Lepidosaphes lobulatus,* sp. n., from *Casuarina* sp.; *L. mulgae,* sp. n., from the Mulga; descriptions are also given of *L.* (*Aspidiotus*) *gloveri,* Packard, recorded from Victoria and N.S.W. upon oranges and probably introduced from the United States, and of *Lepidosaphes ulmi,* L. (*pomorum* Bouché) on *Ulmus campestris.*

Gurney (W. B.). **Thrips in Orchards. A Warning to Fruit-growers.** —*Agric. Gaz. of N.S.W., Sydney,* xxv, pt. 8, August 1914, pp. 685–687.

There was a serious infestation of *Thrips tabaci* in N.S.W., in September and October, 1913, on a great variety of cultivated and uncultivated plants. Widely separated districts suffered and the losses amounted in some cases to 75 per cent. of the crop. In orchards all refuse under or between the trees should be destroyed before the end of August and the soil ploughed as close to the trees as possible. The fruit trees should be sprayed as late as possible before the buds open, with the lime-sulphur wash recommended (53 lb. freshly burned quick-lime, 100 lb. flowers of sulphur, 50 gallons water), diluted with 7 gallons of water; as the buds are opening, use tobacco wash (1 lb. to 2 gallons water) with high pressure. The development of this Thrips from egg to adult occupies from 16–21 days under warm conditions, longer in cool weather. The eggs, which are deposited in twigs and flowers, hatch in 4–7 days; the young forms feed and grow for two weeks, during which they moult three times. There may be many generations during the summer and all stages of development are to be found in the same flower at the same time.

Green (E. E.). **A New British Coccid** (*Kuwania britannica.*)—*Ent. Monthly Mag., London,* xxv, no. 296, August 1914, pp. 197–199.

A new Coccid, obtained from birches in Camberley, Surrey, is described, viz., *Kuwania britannica,* sp. nov. This is a particularly interesting record, because this insect belongs to the sub-family *Margarodinae,* of which there have hitherto been no British representatives and the other two known species of the genus occur in Japan and Ceylon.

WHITE (P. B.). **The Food of the Common Mole.**—*Jl. Bd. Agric., London,* xxi, no. 5, August 1914, pp. 401–407, 1 table.

Investigations into the food of the common mole, *Talpa europea,* in North Wales, show that earth-worms and leather-jackets (*Tipula* larvae) are the staple articles of diet; a mole eats on an average 20 leather-jackets a day, while centipedes were found in 50 per cent., and wire-worms in 41 per cent. of the stomachs examined. It is suggested that an examination of the stomach contents of these animals would often give a good idea of the soil pests of a particular piece of land.

JACK (R. W.). **The Dusty Surface Beetle** (*Opatrum aequale*).—*Rhodesia Agric. Jl., Salisbury,* xi, no. 6, August 1914, pp. 894–981, 2 plates.

*Gonocephalum simplex,* F., (*Opatrum aequale*) is a beetle of nocturnal habits, which lives on the surface of the soil; by day it hides in sheltered places, and is generally associated with *Emyon tristis*; the larvae emerge in from 7–10 days from the date of oviposition and they somewhat resemble Elaterid grubs, but differ in having the first pair of legs stouter than the others; they form fragile, earthern chambers in which they pupate. Pupation takes place about the end of November, the adults emerging in December. Their chief food-plant is maize, which they seriously damage by devouring the dry seed and nibbling the young heart-leaves; they also injure newly-planted tobacco, potato stems and various cruciferous plants; the beetles also eat vegetable rubbish and are active scavengers. The most effective control method is to destroy the adults with poisoned bait of the Mally formula: Soda arsenite, 1 lb.; black sugar, treacle or molasses, 8 lb.; water, 10 gals. Dissolve the arsenite in a little boiling water and add to the sugar or treacle solution; moisten finely chopped up grass with the poison and scatter over the infested ground. One and three-quarter sacks of the chopped bait are sufficient for 5 acres, the cost, including labour, being less than 1*s.* per acre. It is important not to apply the bait too early; February is the best time, or when planting is delayed until December, the bait should be applied before planting.

SHINN (J. C.). **The Apricot.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 8, August 1914, pp. 304–309.

The black scale, *Saissetia oleae,* the brown scale [*Eulecanium corni*], and borers are the insect enemies of apricots mentioned in this paper, which mainly deals with cultural questions. Spraying with distillate, or a crude oil emulsion, each year in the spring is recommended in preference to the use of natural enemies; this spray will never exterminate the scale, but will reduce it to a minimum, and the resulting injury will be very slight.

MASKEW (F.). **Horticultural Quarantine.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 8, August 1914, pp. 309–318.

This paper outlines the origin, development and practice of horticultural quarantine in California, which was the first country to make an original departure in the application of quarantine regulations, and

in an Act approved 4th March 1881, the mention of the word quarantine as applied strictly to horticultural material is found for the first time. The San José scale, the codling moth, the cottony cushion scale, and the Mediterranean fruit-fly are all mentioned as having caused a reduction of agricultural assessment values or necessitated the amending of the quarantine regulations in the State. The quarantine law, as affecting shippers, purchasers, planters of trees from outside the state, and growers of agricultural and horticultural products within California itself, is examined. The staff available for the service of the State agricultural quarantine law is compared with that for carrying out the Fish and Game law. Under the former there are 9 quarantine officers, 44 quarantine guardians and 144 county inspectors, making a total of 197 as compared with a total of 773 under the latter.

Butcher (A. C.). **Cherry Culture.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 8, August 1914, pp. 318–326, 3 figs.

Until a few years ago the cherry-grower had little to complain of in the way of pests. Thrips have recently become a menace and are doing a great amount of damage to the orchards, and while the adults destroy blossoms and fruit, the most serious injury is caused by the larvae, which eat the leaf buds as they unfold. Deep ploughing in the autumn is one method of control, but spraying with a tobacco-wash several times during March and April is more effective. The peach-borer, *Sanninoidea opalescens,* is also troublesome to the cherry-grower; it is found even in the trees as they come from the nursery, but usually orchards will not have to be examined until the trees are three years old; they must then be dug for every year. If the holes at the base of the trees are opened early in autumn and left open till May, the bark on the roots will harden and the young grub cannot penetrate it so easily; a mixture of very thick whitewash applied to the roots does good. A crude oil spray can be used successfully against the Italian scale, *Aulacaspis pentagona,* and cherry scale, *A. forbesi,* and red spider can also be eradicated by spraying.

**Insect Notes.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento,* iii, no. 8, August 1914, p. 338.

The minute false chinch-bug, *Nysius angustatus minutus,* has been found attacking the foliage of young peach and apricot trees, and *Tetranychus simplex,* Banks, is damaging cypress, maple, and other shade trees. The pear-leaf russet mite, *Epitrimerus piri,* has been taken quite commonly on pear and peach leaves. *Tetranychus bimaculatus* has been injurious to prune and almond trees after 1st July, but previous to that time, *Bryobia pratensis* was the most common mite in orchards; the woolly aphis, *Schizoneura lanigera,* is of very common occurrence on the roots of Bartlett pear trees. The black scale, *Saissetia oleae,* has been reported as occurring in exceptional numbers on walnuts in the Goleta district, the infestation, which is confined chiefly to the small limbs, being the heaviest ever observed; over 90 per cent. were parasitised by the Chalcid, *Scutellista cyanea,* Motsch., both larvae and pupae occurring on July 14th when

the observations were made. The alfalfa looper, *Phytometra* (*Autographa*) *californica*, Speyer, has been very abundant in the central part of the State, and the Eastern peach-tree borer, *Sanninoidea exitiosa*, Say, has been taken in a peach orchard; the attack is slight and appears to be the first report of an orchard infestation by this pest in California. Two limited infestations by the California peach-tree borer, *S. opalescens*, Edw., have been discovered; *Hoplia pubescens*, Lec. [? *H. convexula*, Lec. (*pubicollis*, Lec.)], was feeding in large numbers during July on the blossoms of the azalea, *Rhododendron occidentale*, and the yarrow, *Achillea millefolium*.

WELDON (G. P.). **Notes from the County Commissioners.**—*Mthly. Bull. Cal. State Commiss. Hortic., Sacramento*, iii, no. 8, August 1914, p. 339.

A spraying demonstration with atomic sulphur for the control of the almond mite, *Bryobia pratensis*, and red spider, *Tetranychus bimaculatus*, was recently conducted in an orchard where the presence of these mites had resulted in considerable damage to the crop. Ten days later an examination of the sprayed trees showed that the treatment had been very effective; no living brown mites were seen on trees, and only a few immature forms of the red spider. Unsprayed trees in the same orchard were severely infested.

WILLIAMSON (G. A.). **Industria del café en Colombia.** [The coffee industry in Colombia.]—*Rev. Económica, Tegucigalpa* (*Honduras*), iv, no. 4, August 1914, pp. 242–246, 6 figs.

The insect enemies of coffee in Colombia are the Longicorn beetle, *Xylotrechus quadripes*,* and the Coccids, *Pseudococcus adonidum* and *Saissetia hemisphaerica* (*Lecanium coffeae*), the determinations not being quite certain. The carrier ant also attacks coffee.

SURFACE (H. A.). **Some Pennsylvania Birds and their Economic Value.**—*Bi-Mthly. Zool. Bull., Penns. Dept. Agric., Harrisburg*, iii, nos. 5 and 6, September–November 1913, pp. 153–216, 11 pls. [Received 9th November 1914.]

This bulletin gives the results of investigations by the Pennsylvania Bureau of Zoology and the U.S. Biological Survey regarding birds of economic importance owing to their insectivorous habits. Among a large number mentioned are the red-winged blackbird, *Agelaius phoeniceus*, L., one-fourth of the food of which consists of insects, and the service rendered by this bird by the destruction of noxious insects and weed seeds far outweighs the damage it does by consuming grain. The examination of the stomachs of 228 meadow larks, *Sturnella magna*, L., showed that the insect-food constitutes 72 per cent., including SCARABAEIDAE, Termites, and PENTATOMIDAE. Caterpillars, ELATERIDAE, May beetles, and CHRYSOMELIDAE (especially *Diabrotica vittata*) are included in the 83 per cent. animal food of the Baltimore

---

[*This name is probably incorrect, as this species, so far as is known, only occurs in India.—ED.]

oriole, *Icterus galbula*, L.; 57 per cent. of the animal food of the grasshopper sparrow, *Coturniculus savannarum australis*, Maynard, consists of insects, grasshoppers comprising 23 per cent. Among the insects eaten by the blue grosbeak, *Guiraca caerulea*, L., 67 per cent. of the food of which is animal, are grasshoppers, weevils, the purslane sphinx, and cutworms; this species deserves protection for its destruction of grasshoppers alone. *Spiza americana*, Gmel., is a bird of pastures and grass-grown fields and 68 per cent. of its food consists of insects.

Reddick (D.). **Factors influencing successful orchard spraying.**—*Ann. Rept. Maine State Pomol. Soc.*, 1914–15 (*sic*), pp. 34–49 [included in *Agriculture of Maine, 1913*, received 7th October 1914].

In spraying against the wind, the nozzle should be held at such a point as to cover one side directly and allow the wind to carry the mist back and cover the opposite side of the branches; the team being headed into the wind. The spray poles are thus held out laterally and the tree may be combed with spray, without wetting either operator or horses. The operator on the ground should be provided with a hose of sufficient length to work on the next tree behind that which the man on the tower is spraying. Each branch must receive individual attention, and one of the operators should be sufficiently elevated to enable him to drive the spray down into the blossom clusters or later into the calyx cup. In experiments to determine the comparative effectiveness of dusting and spraying against insect pests, better results were obtained with the dust mixture (finely ground sulphur mixed with powdered arsenate of lead to make a 20 per cent. lead mixture, applied at the rate of 1½ to 2 lb. per tree) than with the liquid form (commercial lime-sulphur diluted at the rate of 1:40, to every 100 U.S. (83 Imp.) gallons of which was added 2 lb. powdered arsenate of lead, applied at the rate of 2½ gallons per tree). Against apple scab the liquid gave the better results.

Siegler (E. H.). **The Pear-leaf Blister Mite.**—*Ann. Rept. Maine State Pomol. Soc.*, 1914–15 (*sic*), pp. 143–150 [included in *Agriculture of Maine, 1913*, received 7th October 1914].

This is a popular account of the pear-leaf blister mite, *Eriophyes pyri*, Pgst. Lime-sulphur, kerosene emulsion and the miscible oils may be employed against the mite, applied in autumn as soon as possible after all the leaves have dropped, or in the spring as soon as the buds are swelling and the tips of the new leaves appearing. Commercial lime usually contains magnesium oxide, but in order to eliminate the sludge content, only very pure (98 to 99 per cent.) ground-lime should be used.

Gardner (A. K.). **Report of the State Horticulturist.**—*12th Ann. Rept. Maine Commissioner Agric., Augusta,* 1913, pp. 46–102 [included in *Agriculture of Maine, 1913*, received 7th October 1914].

The most efficient control method against apple-tree tent-caterpillar (*Malacosoma americana*) is to apply a dormant spray; either one gallon of lime-sulphur to ten gallons of water, or ten pounds of soluble sulphur

to fifty gallons of water; this prevents the hatching of the eggs. In controlling the pear-slug (*Eriocampoides cerasi*) hellebore and black leaf 40 have proved the most efficient; cherry and plum are also attacked. Premature ripening of currants and gooseberries is often due to the attack of the gooseberry fruit-fly which sometimes destroys 75 per cent. of the crop. The adult fly emerges during early summer and the females deposit one egg in each fruit. After hatching, the larva eats through the fruit to the seed. The winter is passed in the pupal stage, the cell being about half an inch below the surface of the soil. A sweetened poison spray (sugar 3 lb., arsenate of lead 4 oz., water 5 gallons) seems to attract the fly, but a number of applications are required. The best spray mixture at present in use against the green apple-aphis is black leaf 40, combined with sufficient soap solution to render it adhesive. Cloudy days, when the humidity is high, and late afternoons are the best times for application, as rapid evaporation has a tendency to reduce the effectiveness of any contact spray. When properly applied, tobacco-stem decoction, kerosene emulsion, whale-oil soap, and even ivory soap, have produced good results. Spruce, fir, larch, hemlock and white pine have been attacked by increasing numbers of spruce bud-worm (*Tortrix fumiferana*), but during the latter part of the season this has been controlled to a great extent by parasitic spiders. The larva begins feeding when growth starts in the spring and becomes mature about the middle of June; pupation then takes place, the moth emerging about ten days later. Eggs are laid in small oval patches on the side of the needle from the end of June to the end of July; these eggs hatch in about a week and the young larvae feed on the terminal shoots of the branches for a short time before hibernating near the bud. A most efficient control method consists of spraying with lead arsenate, 5 lb. to 100 U.S. (83 Imp.) gallons of water.

PHILBROOK (E. E.). **Report of the Special Field Agent in charge of Gypsy Moth work, 1913.**—*12th Ann. Rept. Maine Commissioner Agric., Augusta,* 1913, pp. 103–114 [included in *Agriculture of Maine, 1913,* received 7th October 1914].

At the close of 1912, 85 towns infested with gipsy moth were reported, but during 1913, this figure increased to 171, and it was doubtful if the limit had then been reached. In order to carry out the present methods of control a very large sum of money would be necessary—too large for the State to raise—and therefore the education of the public to handle their own infestations is advised. To assist them, high-power spraying machines should be purchased by the different towns. In orchards the gipsy moth is readily controlled by painting the egg-masses with creosote in winter and by spraying the trees with arsenate of lead, 10 pounds to 100 U.S. (83 Imp.) gallons of water, in early spring when the eggs are hatching. The work of breeding and liberating parasites conducted at the laboratory established in March 1913, has thus far been concerned with *Apanteles lacteicolor* and *Meteorus versicolor*, enemies of the brown-tail moth, *Compsilura concinnata*, parasitic on both the gipsy and brown-tail moths, and *Calosoma sycophanta* which preys on both pests. A description is given of the method of rearing *Apanteles* adopted at

the laboratory. In the field, the cocoons were placed in a waterproof box slightly perforated on the side, nailed to the tree, both tree and box being smeared with tree-tanglefoot to prevent destruction of the cocoons by ants, and there left to emerge. *Compsilura concinnata* should prove of great economic value, as at least sixteen insects native to Maine, including the cabbage butterfly and tussock moth, are known to serve as its hosts.

COLTON (W. W.). **Report of Superintendent of Gypsy and Brown-tail Moth work.**—*Ann. Rept. Park Commissioners, Fitchbury, Mass.*, 1913, pp. 25–36, 3 pls. [Received 30th November 1914.]

The decrease by one-third in the number of gipsy moth nests found during 1913 is partly due to the spring and summer cleaning of all badly infested places, and the removal of old trees and other hiding places. Increased spraying and the introduction of parasites are additional reasons for the reduction. These measures seem to have produced a solution of the gipsy moth problem in the residential sections of towns and cities, but the woodland problem is yet to be solved. By the removal of trees most suitable for the moths, leaving only the most resistant species, much can be done. The following list applies only to forests and not to orchards or shade trees; in both lists preference should be given to the first-named, the later ones being interchangeable according to circumstances. To be removed: old fruit trees, red and choke cherries, white oaks, thorn apples, grey birch, willows, witch hazel, alder, hackberry, shadbush, hornbeam, hop hornbeam, black cherry, poplar, elm, mountain maple, and striped maple. To be retained: pine, spruce, hemlock, fir, cedar, juniper, larch, ash, hickory, basswood, sugar-maple, red maple, black and yellow birch, tupelo, sassafras, beech, white birch, black oak, chestnut and locust. This does not mean that trees in the second list will not be attacked at all, as practically all are eaten by the full-grown caterpillars. Experiments have proved, however, that the young caterpillar may be starved in the absence of the foliage of the trees in the first list.

For combating the brown-tail moth, *Euproctis chrysorrhoea*, a new method was tried. During the winter the nests were removed from the trees as usual. This practice will probably have to be resorted to for years to come, but for the past two years experiments have been conducted with an autumn spraying, and during the summer of 1913 all street and roadside trees were sprayed. By December 1913, it was clear these operations were successful and would save much expense in the following season.

**Occurrence of the Colorado Beetle** (*Leptinotarsa decemlineata*) **in Germany.**—*Illustrierte landwirtschaftl. Ztng., Berlin*, xxxiv, no. 57, pp. 538–539, 1 fig.

The Colorado potato beetle, *Leptinotarsa decemlineata*, which had not been seen in Germany since 1887, has appeared at Hohenwedel, near Stade, a Hanoverian town near the mouth of the Elbe. A potato field covering about 7½ acres was infested, the pest having apparently been introduced in some packing material in which a local fruiterer had

received a consignment of bananas and southern fruit from Hamburg and which was thrown into the field in question. The spot was isolated, not even the owners of the land being allowed access to it, and a deep ditch dug round it, the outer side of the ditch being well soaked with petroleum. The beetles and their larvae were collected and placed in trenches together with the leaves of the potato plants and soaked with benzol. The soil was ploughed to a depth of 8 inches and disinfected with crude benzol, 8¼ pints being used per square metre.

Vitkovsky (N.). **О червѣ, повреждающемъ хлѣбныя растенія и о мѣрахъ борьбы съ нимъ.** [On a caterpillar (*Oria musculosa*, Hb.) injuring grain-crops and on methods of fighting it]. *Rostov-on-Don,* 1914, 8 pp.

This is a popular account of damage done to crops by caterpillars of *Oria* (*Tapinostola*) *musculosa.* This is the most serious pest of grain-crops in South Russia, and in one district of the province of Don 2,700 acres of crops were damaged, of which 810 acres were totally destroyed. The females are on the wing during July and August, and oviposit on the stems of grasses or on the stubble of grain-crops ; the eggs remain over the winter and the caterpillars hatch early in the spring. The larvae enter the stems of grain through a minute hole bored close to the earth. Before pupation they gnaw through the base of the ear. Preventive measures include the cultivation of strains proof against the pests, rotation of crops, careful removal and destruction of all weeds, deep-ploughing, and burning of stubble and rubbish after the harvest.

Vitkovsky (N.) **,,Зимнія Гнѣзда" боярышницы и златогузки.** [The "winter-nests" of *Aporia crataegi* and of *Euproctis chrysorrhoea.*]—**Изданіе Бессарабскаго Губернскаго Земства,** [Published by the Zemstvo of the government of Bessarabia], *Kishinev,* 1914, 9 pp., 13 figs.

This is a popular pamphlet directing the attention of fruit-growers to single entangled leaves, hanging by a thread of web on trees in winter, which are the "winter nests" of single individuals of *Aporia crataegi* and also to balls of leaves, fixed with webs to the trees, containing colonies of caterpillars of *Euproctis chrysorrhoea.* The caterpillars of the first-named pest winter inside a cocoon, while those of the second winter as larvae, and sometimes in warm autumn days come out of their nests to warm themselves in the sun. The systematic collection and destruction of the "nests" between November and March is urged. The larvae of *E. chrysorrhoea* also occur on oak and elm, which must be inspected if they are in or near orchards.

Vitkovsky (N.). **Яблонная и плодовая моли.** [*Hyponomeuta malinellus*, Zell., and *Hyponomeuta variabilis*, Zell.]—**Изданіе Бессарабскаго Губернскаго Земства,** [Published by the Zemstvo of the government of Bessarabia], *Kishinev,* 1914, 21 pp., 13 figs.

This is a popular account of *Hyponomeuta malinellus*, Zell., and *H. variabilis*, Zell., the first of these pests injuring exclusively apple-trees, while the second attacks various fruit trees, but in Russia

mostly plums. The cocoons of *H. malinellus* are opaque and crowded together, thus differing from those of *H. variabilis*, which are transparent, so that the pupae can be seen through them, and do not touch each other.

Michailov-Doinikov (A.). **Результаты опытовъ съ ловчими кольцами въ борьбѣ съ плодожоркой.** [Results of experiments with trap-belts in the campaign against *Cydia pomonella.*]—Published by the Astrachan Society of Horticulture and Agriculture, *Astrachan*, 1914, 4 pp.

This article gives some data as to the number of caterpillars of *Cydia* (*Carpocapsa*) *pomonella* caught in trap-belts during experiments by the Astrachan Entomological Station between June and August, 1913. The belts were put on 78 trees, 53 of which were apple trees and the remainder pears, and were inspected about once a week. The total number of caterpillars and pupae collected during these inspections was 4,980, being an average of about 80 on each apple tree, and 28 on each pear tree. The number collected was in proportion to the harvest yielded by the respective trees and therefore the necessity of putting trap-belts both on the trunk and on some of the thicker branches of trees which promise a heavy yield, is urged.

Kartzov (A. S.). **Доходная культура баклажановъ и томатовъ.** [The profitable cultivation of aubergines and tomatoes.]—**«Огородная библіотека.»** [*Market-gardening Library, No. 5*], Supplement to *Progressive Fruit-Growing and Market-Gardening, Petrograd,* 1914, 38 pp., 12 figs.

Among the insect pests of tomatoes which are described as injuring young transplanted crops are *Gryllotalpa vulgaris* and *Euxoa segetum* which attack the stems. The caterpillars of *E. segetum* are injurious on virgin soils during the first year of cultivation and disappear afterwards.

Plotnikov (V.). **Насѣкомыя, вредящія садоводству, полеводству и огородничеству въ Туркестанѣ съ указаніемъ способовъ борьбы.** [Insects injurious to Orchards, Fields-crops and Market-Gardens in Turkestan, with indications of methods of fighting them.]—**Туркестанская Энтомологическая Станція.** [*Turkestan Entomological Station,*] *Tashkent*, 1914, 216 pp. 122 figs.

This book is intended to serve as a manual to the agriculturists of Turkestan and gives general information on insects, their life-histories, enemies and diseases, remedies against them, the preparation and use of insecticides, with figures of various forms of sprayers, trap-belts, etc. Sixty-four species of insects are described, divided into pests of general agriculture and those of orchards, and classified according to the nature of the injury done.

Insects injuring roots include *Polyphylla adspersa*, Motsch., the larvae of which are most serious pests of fruit nurseries, gnawing the roots of young trees. They are usually found in company with *Polyphylla tridentata*, Reitt. These chafers emerge from the earth

during June and are on the wing up to the end of July or later. The larvae pupate at the beginning of the third summer and produce an imago in a fortnight. The only satisfactory remedy suggested consists in digging out the larvae and pupae, which must be done early in summer, before the insects are on the wing. *Melolontha afflicta*, Ball., is less injurious than *P. adspersa*, the larvae being found underneath old fruit trees or large shade trees, where they seldom do any great damage. Other root-feeding beetles are *Amphimallus* (*Rhizotrogus*) *solstitialis* and *Oryctes nasicornis*, L., the adults of the latter being on the wing in May, June and part of July ; the larvae sometimes attack the roots of fruit-trees.

Pests of the trunks, etc., of trees include :—*Scolytus rugulosus*, Ratz., *S. fasciatus*, Rtt., *Pachydissus sartus*, Sols., and *Cossus* sp. *Pachydissus sartus* attacks mostly poplar, elm and willow trees but in Transcaspia also various fruit trees, such as apple and the pear-plum, *Prunus divaricata*, Ledt., causing great damage. The beetles are on the wing in April and May, and the larvae mine in the bark and sap-wood of the trees and pupate there, the whole development from egg to imago lasting two years. The best remedy consists in removing and burning the attacked trees.

Insects injuring shoots and buds include *Cantharis* (*Lytta*) *pilosella*, Sols., the larvae of which are said to be parasites of wild bees in Turkestan ; the beetles gnaw the buds of pear, plum and other fruit trees in March and April and do great damage. The Buprestid beetle, *Capnodis tenebricosa*, Hbst., injures the young shoots and petioles of leaves in Turkestan in May. *Recurvaria nanella*, Hb., the small caterpillars of which feed on unfolded buds, mostly of apple trees, *Eucosma* (*Tmetocera*) *ocellana*, F., and *Tortrix* (*Pandemis*) *chondrillana* can all be combated by means of trap-belts and spraying with California mixture.

Pests of foliage include *Lymantria dispar*, L., which, although frequently found in Turkestan, is not so injurious as in European Russia. Against the caterpillars of *Cosmia subtilis*, Stgr., *Biston cinerarius*, Ersch., and *Hyponomeuta variabilis*, Zell., which is common in the orchards of Ferghana, spraying with Paris green, djipsin and California mixture is recommended. *Polydrosus obliquatus*, Faust, a weevil which attacks stone-fruits, and *Polydrosus ferganensis*, Faust, damaging apples and pears, both appear in April in great numbers. The larvae of *Agelastica orientalis*, Baly, feed on leaves of Lombardy poplar, willows and almond trees. A spray consisting of a solution of about 10 lb. of green soap in 27 gallons of water, should be used while the beetle larvae are still young. *Galerucella luteola*, Mull., winters underneath detached bark, in cracks, etc., and oviposits in spring on leaves ; the larvae pupate in the earth and in June and July a second generation appears which remains over the winter. Spraying with Paris green is recommended against this beetle.

Pests injuring flower buds, blossoms and fruits include :—*Platyptilia rhododactyla*, F., the caterpillars of which damage the buds of roses ; *Epicometis turanica*, Rtt. [see this *Review*, Ser. A, i, pp. 437–438], *Oxythyrea cinctella* Schaum., *Rhynchites auratus*, Scop. [see this *Review*, Ser. A, i, pp. 436, 438–441], *Cydia pomonella*, L., *Cydia funebrana*, Tr., and *Sarrothripus musculanus*, Ersch., which feeds on the

pith of the young fruits of the walnut. Attacked fruits can be easily recognised by the frass of the caterpillars pushed out through the entrance hole. When mature, they pupate in cracks or holes of the bark, colonies of cocoons being formed in suitable places. Trap-belts are recommended against this moth, which must be inspected at intervals of 10 days from April to September. Plums are also damaged by *Hoplocampa fulvicornis*, Klug; the adult sawflies are on the wing in April and deposit one egg in the ovary; the larvae penetrate into the fruit and frequently pass from one fruit to another; they pupate in the earth, wintering in this stage. The collection and destruction of damaged fruit and cultivation of the soil underneath the trees are advised. In Turkestan the adult beetles of *Potosia marginicollis*, Pall., do some damage by feeding on fruits injured by other pests, mostly apples and pears.

Pests which suck the juices of plants include the aphids, *Schizoneura lanigera*, Hausm., *Aphis mali*, F., *A. piri*, Koch, *Hyalopterus pruni*, F., *A. prunorum*, Dobrovl., and *Lachnus persicae*, Chol. The last-named mostly attacks peach-trees, less frequently almond and apricot trees; the summer colonies can be destroyed by careful spraying with kerosene or quassia emulsion, while smearing with California mixture is recommended against the winter forms. Among scale-insects mentioned are *Eulecanium bituberculatum*, Targ., *E. pyri*, Schr., which are found on young branches of apple and pear trees, *Eulecanium* (*Physokermes*) *coryli*, L., attacking various fruit trees, *Lepidosaphes ulmi*, L., (*Aspidiotus conchiformis* and *Mytilaspis pomorum*), also injuring apple and pear trees. There are also a great number of other Coccids in Turkestan, the majority of which have not yet been investigated. *Psylla pyricola*, Forst., and *Stephanitis* sp., are described. The latter breeds on apple and pear trees, both larvae and adults sucking the lower sides of the leaves. The black eggs of this pest are deposited in the tissue of leaves on the lower side from which part of the egg projects slightly. The adults winter and appear in April, three or four generations occurring during the summer. The remedies consist in cleaning the bark in autumn, destroying all rubbish and fallen leaves and in spraying with kerosene or quassia emulsions repeatedly every two or three weeks. *Eriophyes pyri*, Pagst., injures the foliage of pear trees and *Eriophyes vitis*, Nal., that of the vine. A useful spray against these mites consists of a mixture of 3 lb. of flowers of sulphur and 3 lb. of lime in 27 gallons of water.

The third part of the book deals with agricultural and market-garden pests, including *Pieris brassicae*, L., the caterpillars of which injure cotton in Ferghana and Transcaspia, some 90 per cent. of the crop having been destroyed in 1913 in Ferghana, also maize and lucerne; *Chloridea obsoleta*, F., which is particularly injurious to cotton in Transcaspia and should be controlled by trap-crops of tomatoes on cotton plantations, which must be inspected every week; *Chloridea dipsacea*, L., the caterpillars of which attack lucerne, tomatoes and cotton and have three or four generations yearly; *Laphygma* (*Caradrina*) *exigua*, Hb., and *Eubolia arenacearia*, Hb., which both attack lucerne; *Phlyctaenodes* (*Eurycreon*) *nudalis*, Hb., injures beet-root. Psychid larvae have attacked lucerne and cotton in the

irrigated lands of the "Starvation Desert" in the first year of cultivation, and as great numbers of these pests were found on other parts of the Desert not yet irrigated they evidently breed on the steppe plants. Both beetles and larvae of *Epilachna chrysomelina*, F., attack Cucurbitaceous plants. The Cantharid beetle, *Epicauta latelineolata*, Muls., though useful as a parasite of locusts may, when in large numbers, become injurious to agriculture. Among weevils, the larvae of *Sitones longules*, Bohem., injure the roots of lucerne and *Hypera* (*Phytonomus*) *variabilis*, Hbst., the leaves. The adult beetles of *Chaetocnema breviuscula*, Fald., skeletonise the leaves of beet. They oviposit in the earth, producing adults in autumn which hibernate. Spraying the young plants with Paris green, or catching the beetles on shields, covered with some sticky matter and pushed between the rows, is advised. *Lema melanopa*, L., injures wheat, oats and other grain crops, gnawing longitudinal furrows in the leaves. Among the Hemiptera the adults and larvae of *Eurydema maracandica*, Osh., suck the leaves of cabbages. *Eurygaster integriceps*, Osh. [see this *Review*, Ser. A, i, pp. 446–451] is very injurious in Transcaspia. *Aelia furcula*, Fieb., did great damage to summer-sown wheat in some parts of the district of Samarkand during the last years of the last century. The larvae do not attack winter wheat, as the grain is already sufficiently hard at the time of the appearance of the pest. They winter as adults amongst herbaceous plants or in holes in the earth and oviposit in March. The larvae emerge in a week, proceed to migrate into the steppes, feeding on steppe plants and also attacking wheat, but no other grain. Sokolov, who studied these pests, recommends burning the dried grasses of the steppes in autumn. *Aphis gossypii*, Glov., attacks cotton and bachza plants. *Thrips flavus*, Schr., does great damage to cotton, while the plants are young. Injurious locusts include *Caloptenus italicus*, L., *Stauronotus maroccanus*, Thunb., *Stauronotus kraussi*, Ing., and *Locusta* (*Pachytylus*) *migratoria*, L. The mite, *Tetranychus telarius*, L., is a serious pest of cotton plantations.

Sacharov (N.) & Shembel (S.). **Отчетъ о дѣятельности Энтомологической Станціи за 1913 годъ.** [Report on the activity of Entomological Station in 1913.] Published by the Entomological Station of the Astrachan Society of Horticulture and Agriculture. *Astrachan*, 1914, 51 pp. 17 figs.

The greater part of this report deals with the campaign against locusts, outbreaks of which, in various parts of the Government, have occurred practically yearly since 1880. A list of the local species of locusts was given in last year's report [see this *Review*, Ser. A, i, pp. 534–536] and the current report mentions only the most injurious, viz. :—*Locusta migratoria*, L., accompanied by small numbers of *L. danica*, L., which is predominant in the districts of Astrachan and Krasnorjarsk and along the mud lagoons and marshes of other districts; *Paraleurus alliaceus*, Germ., and *Aeolopus* (*Epacromia*) *viridis*, Kny., which are very injurious in some parts of the southern districts of the government; *Caloptenus italicus*, L., the most serious pest of the steppes, where *Oedipoda coerulescens*, L., *Oedaleus nigrofasciatus*, De Geer,

*Tmethis* (*Eremobia*) *muricata*, Pall., *Pyrgodera armata*, Pall., and others also occur. Up to 1912, the campaign against locusts was conducted exclusively by mechanical means, burning and driving hoppers into trenches, etc., which was very expensive and not effective, destroying under the most favourable conditions only 50 per cent. Experiments with chemicals, conducted by one of the authors in 1912, proved very successful and in 1913 it was decided by the authorities to conduct the campaign by this method. A total area of 14,700 acres in the government were infested with egg-clusters of locusts, but the actual campaign was conducted only on some 5,400 acres, the remainder of the infested territory being flooded in spring; about £2,800 was assigned for this purpose, partly from local funds and partly from subsidies from the central government, but only £2,500 was actually expended, including the cost of about 5 tons of Paris green, about 10 tons of lime and 4 tons of glue. The campaign which started more or less simultaneously with the hatching of the eggs, began on 19th May and was practically over on 28th May, when it was difficult to find any locusts. It was found that heavy dews and high winds made stronger solutions necessary, and the following mixture was used: 1 lb. of green, 2 lb. of lime, 1–2 lb. of glue in $13\frac{1}{2}$ gallons of water; in 1912 green soap was used instead of glue, and though glue gave good sticking qualities to the insecticides it entailed much labour and expense in fuel to bring it into a liquid state. This insecticide caused the death of the hoppers after 12 hours and an average of a little over 10 lb. of green was required for 3 acres of thinly planted land and 12 lb. if covered with thick grass. Various mosquitos, both *Anopheles* and *Culex*, which appear in enormous swarms from June onwards, compelled the stopping of the daily operations at least one hour before sunset. On the lower reaches of the Volga, where fishing is the chief occupation of the population, there is little interest in the fight against locusts and, on the contrary, the appearance of large swarms is often concealed, as the hoppers are used there as baits for fishing and have a market value of 7*d*. to 8*d*. per 100; they are caught and kept in special baskets and fed on seeds. The operations were also hampered through the frequent necessity of conducting them in flooded places, or in spots thickly covered with reeds. Notwithstanding all these drawbacks the pests have been totally destroyed wherever the chemical method was applied. The operations were nearly everywhere finished at the time when the winged forms appeared, which began on the 3rd July, as was also the case in 1912. The average cost of the chemical method was about 8*s*. per acre, which figure, although high in comparison with the cost of the same method in other governments, owing to the peculiar conditions prevailing in Astrachan, is nevertheless much lower than the cost of mechanical remedies, which amount to nearly 15*s*. per acre. The projected campaign in 1914 will have to be conducted over an area of nearly 18,000 acres infested with egg-clusters. The greatest number of these generally occur at the bottom of the "Baer ridges," where as many as 10 to the square foot may be found. These ridges have a clay soil and are covered with scanty vegetation; their bottoms have a slightly saline character, and are always covered with rich vegetation. The ridges are frequented by locusts for purposes of oviposition and must be considered as constant breeding places of *L. migratoria*. A full investigation of the question

of the destruction of egg-clusters by floods has not yet been made, but it has been conclusively established that they decompose after three weeks under water, if not before. The spring floods cover the soil with a thick stratum of mud which, on drying after the floods subside, forms a hard coat which prevents the emergence of the young, even if the eggs retain their vitality. On spots kept constantly wet by water from springs, hatching takes place, but development is delayed. Observations on parasites of locusts show that the most important is *Sarcophaga lineata*, Fall., the larvae of which were found both on the larva and imago and cause a death rate of 22 per cent. The Bombyliid fly, *Anastoechus* (*Systoechus*) *nitidulus*, F., was frequently found in the egg-clusters, and experiments have proved that the imago of this parasite appears in nature only at the time when the locusts start ovipositing. The percentage of clusters destroyed by this parasite has not been ascertained ; their larvae were found in elevated places, while only single specimens appeared in low and damp places and no larvae at all where there was a thick overgrowth of reeds. Another parasite of *L. migratoria* was a worm of the genus *Mermis*, which caused a death rate of 10 per cent. ; the parasite was found both in larvae and imagos, from one to three worms being discovered in one individual. Locusts infested with this parasite ultimately perished. *Caloptenus italicus* was attacked by a fungus, *Empusa grylli*, Naw., but individuals found dead from this disease had already oviposited.

Other pests of importance in the government were :—*Euproctis chrysorrhoea*, L., destroying whole orchards of quinces, which were also attacked by *Biston hirtarius*, Cl., in enormous swarms. The outbreak of the latter moth afforded an opportunity for the study of its life-history and a special report on it will shortly appear. Apple, cherry, pear, poplar trees and others suffered from an outbreak of the Galerucid beetle, *Luperus longicornis*, F., which was specially injurious in young nurseries, the damage done occurring between 4th and 14th May, after which the insects passed to meadow plants. Orchards in the district of Zarev suffered mostly from *Rhynchites auratus*, Scop., *Anthonomus pomorum*, L., *Cydia* (*Carpocapsa*) *pomonella*, L., *Eucosma* (*Tmetocera*) *ocellana*, F., *Aphis pomi*, de G., and *Tingis pyri*, F. In the districts of Astrachan, Krasnorjarsk and Enotaievsk, orchards were damaged by *C. pomonella*, L., *Polychrosis botrana*, Schiff., *Rhynchites auratus*, Scop., *Epicometis hirta*, Poda, *Hyponomeuta malinellus*, Z., *Aphis pomi* and *Psylla pyricola*, Forst. It was noticed that *Hyponomeuta malinellus* disappeared in the year under report from localities which in the previous year were visited by *Phlyctaenodes sticticalis*, and this fact is attributed to the influence of parasites of the latter pest. Strawberries suffered from *Galerucella tenella*, L., while poplar trees were injured by caterpillars of *Lithocolletis populifoliella*, Tr., which damaged leaves, and by *Paranthrene* (*Scapteron*) *tabaniforme*, Roth., injuring the wood of young trees. *Opatrum sabulosum*, Bjerk., damaged young maize, lucerne, sunflowers and beetroot, and the Pyralid, *Homoeosoma nebulella*, Hb., greatly injured early plantings of sunflowers, though no damage was done to late plantings. A flea-beetle, thought to be *Chaetocnema aridula*, Gyll., destroyed oats and wheat in one locality. *Euxoa segetum*, Schiff., injured seedlings of melons.

Dessiatov (G.). **Роза: Культура въ грунту и подъ стекломъ.** [Rose cultivation in soil and under glass.]—« **Прогрессивное Садоводство и Огородничество.** [Supplement to *Progressive Fruit-Growing and Market-Gardening*], *Petrograd,* 1914, 128 pp., 84 figs.

In this book some twenty pages are devoted to the description of various insect pests and diseases of roses. Of 70 species of insects injurious to roses, only the principal ones are described, classified according to the part of the plant they attack.

The insect most dangerous to the roots is *Melolontha melolontha*, the damage being done by the larvae. The only preventive remedy seems to be to make the bottom and sides of rose beds impassable for the larvae, lining them with broken glass or gravel. To protect the beds from direct oviposition by the females, they must be covered with straw during the whole time the pests are on the wing and the straw afterwards destroyed.

Of the insects injurious to the stems, *Arge* (*Hylotoma*) *rosae*, L., oviposits inside the ends of the young shoots. Usually two generations of this sawfly occur in Russia, the first one appearing in May and the second in August. The larvae feed on the parenchyma of the leaves of roses, and after a few weeks, pass into the earth and pupate. The most effective remedy consists in collecting the imagines while ovipositing, and against the larvae, spraying with arsenicals is recommended. Another species, *Arge* (*Hylotoma*) *pagana,* Panz., is less widespread. *Aulacaspis* (*Diaspis*) *rosae,* the larvae of which appear in spring, is very injurious. Roses of the *centifolia* variety and those which are lightly pruned, are more subject to attack. The remedies consist in cutting away and burning the damaged shoots, in cleaning the less affected shoots, with a brush or a wooden spatula, and spraying in spring, before the scales have hardened, with tobacco extract or kerosene emulsion. *Tenthredo bipunctata* attacks the tips of young shoots, inside which the larvae form a burrow. When mature the larvae leave the shoots and pupate in the earth, wintering in the pupal stage and producing the imago in the following May. Attacked shoots should be cut off and destroyed. *Thomasia* (*Clinodiplosis*) *oculiperda*, Rubs., is a dangerous pest in nurseries where the grafting of roses is carried on. The fly oviposits in June, at the point of the slit between the graft and the edge of the bark of the wild stock, fresh grafts, as well as those 8–14 days old, being attacked, a proper union being prevented by the injuries to the tissue and the excrement of the larvae. In from 4 to 6 weeks the larvae pupate in the earth at a depth of about 2 inches, and remain in this stage 8–10 months, the imago appearing in the following year. This pest, which is very widespread in Germany, is less common in Russia. Grafts on the stem suffer more than those on the collar, which if covered with earth are effectually protected. The dressing on the graft must be fitted so closely that the female will be unable to oviposit thereon, this being effected by means of a 2 inch bandage of cotton thread underneath the raffia, or the grafting point may be smeared, over the raffia, with garden pitch. Rose bushes attacked by *Aphis rosae* should be sprayed with quassia extract, prepared from chips of *Quassia amara*, L.,

not of *Picraena excelsa*. When rose bushes are severely infested by Aphids a vigorous syringing with water before spraying is very useful. Various species of *Rhodites* form galls on the stems and leaves of roses. *Rhodites rosae* attacks *Rosa canina* and other wild roses; *R. orthospina*, Beyrins., prefers *Rosa rubiginosa*; roses of the *centifolia* variety are attacked by *R. centifolia*. All shoots showing galls should be destroyed.

The sawflies, *Emphytus cinctus*, *E. rufocinctus*, *Cladius difformis*, *C. pectinicornis*, *Blennocampa pusilla* and *Selandria bipunctata* attack the foliage, as also do the moths *Eucosma* (*Grapholita*) *tripunctana*, *Eucosma roborana*, *Tortrix bergmanniana* and *Coleophora gryphipennella*. Another serious pest of the foliage is *Cecidomyia rosae*, the females of which fly oviposit at the beginning of summer on the leaves while still in the bud. Several generations occur in one summer, and the insect hibernates in the earth as a pupa. The Jassid, *Typhlocyba rosae*, the females of which deposit their eggs in autumn on the ends of the shoots, chiefly attacks those varieties which are lightly pruned.

Various insecticides can be applied against insect pests, the larvae of which feed on the foliage, including Paris green, djipsin and barium chloride. The following recipe is given for the preparation of djipsin: about 1 oz. of sodium arsenate and 3 oz. of lead arsenate are dissolved separately in boiling water in earthenware or glass vessels and then mixed together in another vessel containing so much water that the whole should form 60 gallons.

The beetles, *Phyllopertha horticola*, *Anthonomus rubi* and *Cetonia aurata*, eat the buds and blossoms and are best kept down by hand-picking.

Useful insects mentioned include *Coccinella septempunctata*, L., and *Chrysopa perla*, which destroy aphids.

Various ystems of spraying are described and figured.

Munro (J. W.). **Notes on the Reproductive Organs of the Pine Weevil** (*Hylobius abietis.*)—*Proc. R. Physical Soc., Edinburgh*, xix, no. 6, 1913–1914, pp. 161–169.

This is a detailed account of the reproductive organs of *Hylobius abietis*. It is stated that *H. abietis* is harmless in the larval stage and that weevils which appear in March or April cannot reproduce until the following September or October, and as the adult hibernates, it appears that the eggs of a second generation are not produced till March of the following year.

**Beschreibung der Forste der Kgl. freien Stadt Rokycan, und der in dieselben vom Böhmischen Forstvereine im Jahre 1914 unternommenen Exkursion.** [A description of the forests of the royal free town of Rokycan and of the Bohemian Forestry Society's excursion in them in 1914.] Prague: Verlag des Böhm. Forstvereines, 1914, 36 pp., 1 map.

In the Bohemian forests, *Hylobius abietis* is a constant pest; *Myelophilus* (*Hylastes*) *minor*, *M. piniperda* and in some spots, *Hylastes palliatus* are fairly abundant. The nun-moth, *Lymantria monacha*, is only occasionally seen.

# NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

# CONTENTS.



(C98)

CONTENTS—*continued.*

VOL. II. Ser. A. Title-page and Index. AUGUST, 1915.

# THE REVIEW OF APPLIED ENTOMOLOGY.

## SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY



LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.




*Head Office.*—British Museum (Natural History), Cromwell Road, London, S.W.

*Publication Office.*—27, Elvaston Place, London, S.W.

# INDEX OF AUTHORS.

A reference in heavy type indicates that a paper by the author has been abstracted.



(C132) Wt.P.1212/97. 1500. 7.15. B.&F.Ltd. Gp.11/3.

▲

# GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets it signifies that the name is not adopted.

## NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.